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WAGER (V. A.). **Pythiaceous fungi on Citrus.**—*Hilgardia*, xiv, 9, pp. 535–548, 2 figs., 1942.

The following fungi were isolated during the season 1939–1940 from fibrous dead roots of orange and lemon trees showing dying-back or decline in 22 different localities in southern California, in order of frequency: *Pythium ultimum*, *Phytophthora citrophthora*, *Pythium vexans*, *P. de Baryanum*, *P. rostratum*, and *Phytophthora parasitica* (the last three from only one locality each). More common than any of these, *Fusarium solani* was found on most of the roots from all localities. Inoculations of orange and lemon fruits with cultures of the above fungi and several others recorded on citrus, yielded the following results: *P. citrophthora*, *P. parasitica*, *P. palmivora*, and *P. cactorum* produced a brown rot of fruits whether the inoculum was placed on the surface of the fruit or in shallow or deep wounds; *P. syringae* and *P. megasperma* produced no infection on uninjured fruit and a slow, brown, leathery rot in shallow and deep wounds, while *P. cinnamomi*, which was also unable to infect uninjured fruit, produced a firm, brown, leathery rot of a slightly drier type inside than that produced by the other species; *Pythium ultimum* and *P. de Baryanum* infected only a few uninjured fruits, but both in shallow and deep wounds they produced a rapidly progressing brown rot of a much softer type than that produced by the *Phytophthora* spp.; *Pythium irregulare* behaved similarly but was much less virulent; *P. vexans* produced a distinctive slow rot in both shallow and deep wounds, characterized by a sunken, brown, slushy area surrounded by a water-soaked zone; and finally, *P. rostratum* and one strain of *P. vexans* (with a coiled antheridial branch) failed to infect altogether.

The author gives the geographical distribution of the seven species of *Phytophthora* and tables of morphological and physiological characters of *Pythium* and *Phytophthora* spp. on citrus.

Instructions to Lemon pickers.—*Calif. Citrogr.*, xxviii, 6, p. 144, 1 fig., 1943.

To avoid causing injuries favouring decay by blue and green moulds [*Penicillium italicum* and *P. digitatum*] Californian lemon-pickers are advised always to make two cuts with the clippers, the first leaving at least $\frac{1}{4}$ in. of the stem, and the second proceeding squarely across the stem next to the button. The button itself must not be cut. Ladders should be placed against the trees in such a way as to avoid breaking the limbs or damaging the fruit. The ladder must never be thrown into the tree. When the fruit is transferred to the field box, the whole bag should be lowered carefully into the box, and the fastening and fold loosened; the bag is then drawn away upwards, and the fruit allowed to roll gently into the box. Care must be taken to see that the box contains no sand, gravel, or twigs before any fruit is placed in it. Decayed fruit and fruit picked up from the ground should not go into the box.

SMITH (A. L.). **Lightning injury to Cotton.**—*Phytopathology*, xxxiii, 2, pp. 150–155, 2 figs., 1943.

Since 1936 the writer has inspected a number of cotton fields affected by lightning

injury, which is prevalent throughout Georgia from May to September, assuming a variety of forms, the sudden destruction of well-defined, circular areas being the most frequent and conspicuous. Of rarer occurrence and less easy to diagnose is a dispersed type of damage, in which no evidence of the trouble appears until ten days or more after the storm, when scattered plants turn red, wilt, and die, while numerous gradations between these two symptom complexes are also encountered. In plants suffering from the immediate effects of lightning, death is due to the collapse of tissues outside the xylem on the stems, tap-roots, and larger roots, while in those surviving for varying periods a collar-like enlargement usually appears at or just below soil-level, where complete or occasionally partial girdling takes place. Other features of the delayed form of injury include the formation of irregular, elongated, necrotic areas on the stems. The stem bases and roots of lightning-struck plants of *Gossypium hirsutum* are frequently invaded by *Rhizoctonia bataticola* [*Macrophomina phaseoli*], a parasite of certain Asiatic species of cotton [*R.A.M.*, xxii, p. 204.]

DESCHIEENS (R.). **Sur l'emploi des Hyphomycètes prédateurs dans la prophylaxie des infestations à nématodes des végétaux.** [On the use of predatory Hyphomycetes in the prophylaxis of nematode infestations of plants.]-*C.R. Acad. Sci., Paris*, ccxv, 3, pp. 148-151, 1941.

In order to test the practical utility of certain species of Hyphomycetes found preying on nematodes in nature, the writer added to Petri dishes, each containing 100 larvae of *Heterodera marioni* from *Begonia* roots, two squares, 1 by 1 cm., of cultures of these fungi on a medium consisting of 1 gm. oats chaff, 5 c.c. malt extract, 12 gm. agar, and 1,000 c.c. distilled water [*R.A.M.*, xxii, p. 166]. Under these conditions *Dactylella bembicodes* captured and destroyed 90 per cent. of the larvae in ten days, while *Arthrobotrys oligospora* and *D. ellipsospora* required 15 to 20 days to produce comparable effects. In another test, squares of an agar culture of *D. bembicodes* were buried in damp, heavily infested soil at a depth of 5 cm., attached to a piece of silk wool which was connected with the soil surface by a thread. After 15 days four to five larvae per sq. mm. of the wool were found to have been captured. With a view to obtaining some indication of the range of the predators, spores of *D. bembicodes* were affixed to fragments of straw placed side by side 2 to 3 mm. apart at the rate of 100 gm. per kg. soil. After 15 days hyphae had developed within a radius of 1.5 to 2 cm. from the centre of the straw nucleus.

MADSEN (D. E.). **Some studies of three pathogenic fungi isolated from animals.**—*Cornell Vet.*, xxxiii, 4, pp. 383-389, 8 figs., 1942.

The fungi discussed in this paper are an orange-pigmented species of *Actinomyces* isolated from a Cocker spaniel dog, identified as *A. canis*, a *Cryptococcus* of the *Torula histolytica* (American Type Culture Collection No. 428) type from two guinea-pigs inoculated with purulent lymph glands from a cow, and *Blastomyces dermatitidis* from a male hound.

The *Cryptococcus*, for which the designation *C. rotundatus* is adopted, following Dodge's system of classification [*R.A.M.*, xv, p. 368], differed from the type in its rugose growth on carrot agar at 20 days, dull surface on most culture media, rather pale coloration, and inversion of sucrose.

B. dermatitidis occurred in the affected tissues exclusively in the form of spherical to piriform yeast cells, 5 to 22 μ in diameter, containing refractive globules of food material and enveloped by a doubly contoured wall, 1.5 to 2 μ in thickness. On standard media at room temperature the fungus produced only branched, septate hyphae, 2 to 10 μ in diameter, but on glycerine phosphate agar, chlamydospores, conidia, and terminal hyphospores were abundant. Growth on solid media was mealy at 37° C. and prickly at room temperature; under the latter conditions a

white, woolly mycelium, based on a white, leathery membrane, developed in 10 to 14 days. Incubation at room temperature resulted in the formation of a purple, glistening, very adherent, dome-shaped colony, with coarse, purple spicules radiating upwards and outwards.

All the fungi induced morbid changes in the chorio-allantoic membrane of the developing chick [ibid., xxi, p. 79]. *A. canis* was pathogenic to the rat, mouse, guinea-pig, dog, and cat, while *C. rotundatus* and *B. dermatitidis* were, in general, of a relatively low order of virulence.

SCHOUTEN (G. B.). **Achorion del tipo milochevitchi (Langeron y Baeza) favus del cuero cabelludo.** [*Achorion* of the *milochevitchi* type (Langeron & Baeza) as the cause of favus of the scalp.]—*An. Inst. Biol. Univ. Méc.*, xi, 1, pp. 51-56, 3 figs., 1940.

A species of *Achorion* isolated from the scalp of a ten-year-old boy at Asunción, Paraguay, produced on 2 per cent. glucose agar and other media whitish-yellow, later light chestnut-coloured colonies: at the end of a month irreversible pleomorphism developed in the malt agar cultures. Numerous aleuria were formed terminally or in clusters along the hyphae, while terminal, intercalary, and concatenate chlamydospores were also observed, those in the first-named position sometimes occurring in the form of 'candelabra', a phenomenon regarded by Langeron as indicative of maladjustment to the environmental conditions. On the basis of these characters the organism was identified as *A. milochevitchi* [*R.A.M.*, xx, p. 164].

GONZALEZ OCHOA (A.). **El Microsporum canis (Bodin y Almy, 1879) en México.** [*Microsporum canis* (Bodin & Almy, 1879) in Mexico.]—*Rev. Inst. Salubr. Enferm. trop.*, ii, 3-4, pp. 319-326, 6 figs., 1941. [English summary.]

Out of 135 cases of ringworm of the scalp investigated in Mexico, 13 (9.6 per cent.) were found to be associated with *Microsporum canis*, the remainder being due to *Trichophyton* spp. Three distinct variants of the fungus were observed in pure cultures on Sabouraud's medium (2 per cent. glucose), the most frequent (A) being characterized by white, later canary-yellow to cinnamon-coloured colonies, ultimately assuming a grey coloration owing to the uniform development of a superficial 'down', (B) differing from the foregoing in the presence of grooves radiating from the centre to the periphery, and (C), in which a dirty white veil is rapidly formed, containing an abundance of pluriseptate spindles, 75 by 15 μ , with five to eight locules, some aberrant forms measuring 60 by 18 μ and others small and elongated, approximating to the *Trichophyton* type, and sessile, piriform or sub-cylindrical, occasionally uniseptate aleuriospores, 2.8 or 3 by 2.5 μ . The propagative organs, which also included racquet-shaped hyphae, tendrils, nodules, and chlamydospores, were sparsely represented in variant (A).

VAN PERNIS (P. A.), BENSON (MIRIAM E.), & HOLINGER (P. H.). **Laryngeal and systemic histoplasmosis (Darling).**—*Ann. intern. Med.*, xviii, 3, pp. 384-393, 3 figs., 1943.

The clinical course and post-mortem observations in a case of laryngeal and systemic histoplasmosis (*Histoplasma capsulatum*) in a 63-year-old Latvian male, a preliminary account of which has already appeared (*J. Amer. med. Ass.*, cxvii, pp. 436-437, 1941), are fully described. Tissues and exudates removed from the larynx five months before death were cultured on various media at 37° C. and at room temperature, growth being easily obtainable in three to five days and persisting, predominantly in the mycelial form, through numerous subcultures. The organism develops on many kinds of decaying material, both in sunlight and darkness, the latter condition, as well as humidity, being conducive to growth.

H. capsulatum succumbs to one hour's autoclaving at 15 lb. pressure or half-an-hour's freezing, but was very refractory in dextrose broth cultures to common acids, alkalis, and sulphanilamide derivatives, though showing no resistance to thymol, potassium permanganate, or tartar emetic.

Yeast forms of the fungus, 2 to 4 μ in diameter, were recovered from four out of 15 white mice injected intraperitoneally with 2 to 3 c.c. of a heavy suspension of the mycelial stage, to which they reverted on subculture. Large yeast cells, similar to those described by Moore [*R.A.M.*, xiii, p. 637], were recovered from one of the mice, but on subculturing changed into smaller yeast forms and eventually into the mycelial phase. Cultures from the spleen and liver of mice inoculated with the large yeasts gave rise to the mycelial stage with typical chlamydospores.

NEGRONI (P.). **Transformación 'in vitro' del 'Rhinocladium schencki' en un cultivo levuriforme.** [The conversion *in vitro* of *Rhinocladium schencki* into a yeast-like culture.]—*Rev. argent. Dermatosis*, xxiv, 1, pp. 471–478, 6 figs., 1940. [French and English summaries.]

The conversion of filamentous cultures of *Rhinocladium* [*Sporotrichum*] *schencki* into yeast-like forms was effected by the addition to a 5 per cent. blood agar medium at 37° C. of saline solution (1 in 2,000 to 1 in 4,000), the process being accomplished in 24 hours. On transference to room temperature the colonies revert to the filamentous phase. The levuriform cells were globular, ovoid, or stalagmoid, and measured 2.25 to 4.5 by 3 (average 3.5 by 2.5) μ ; short, moniliform elements were occasionally present. The yeast-like cultures were incapable of fermenting sugars, while the nitrogen auxanogram was positive only for peptone. Pathogenicity to rats was maintained.

A similar observation was made in connexion with *Histoplasma capsulatum*.

SIMSON (F. W.), HARINGTON (C.), & BARNETSON (J.). **Chromoblastomycosis: a report of six cases.**—*J. Path. Bact.*, lv, 2, pp. 191–198, 3 pl., 1943.

Six cases of chromoblastomycosis are reported, the first for South Africa, though Algeria and Rhodesia were already known to harbour the disease. The causal organism was isolated from two of the patients and referred in one case to *Hormodendrum pedrosoi* [*R.A.M.*, xxii, p. 23] and in the other to an unidentified *H. sp.* The dark greyish-green, plush-like colonies of *H. pedrosoi* on 2 per cent. Sabouraud's glucose gave rise to a mycelium composed of long, septate, branching hyphae, 2.5 μ in diameter; sporulation for the first few generations was predominantly of the *Hormodendrum* type, but after repeated subculture on various media most of the spore heads presented a pseudo-acrothecal appearance, no evidence of a *Phialophora* stage having been demonstrated.

The undetermined *H. sp.* was characterized by hyphae similar to the foregoing bearing lateral conidiophores and concatenate conidia, the size of which gradually decreased towards the periphery of the chain, those nearest the conidiophores measuring 8 to 10 by 2.5 to 4 μ and the intermediate elements ranging from 3 to 5 μ in diameter.

MACKINNON (J. E.) & SCHOUTEN (G. B.). **Investigaciones sobre las enfermedades de los cabellos denominadas 'piedra'.** [Investigations on the hair diseases named 'piedra'.]—*Arch. Soc. Biol. Montevideo*, x, 4, pp. 227–266, 26 figs., 1942. [English summary.]

Two distinct conditions are known as 'piedra', one black and the other white, the following being among the differences observed between them, based on three cases studied by the writers in Paraguay in comparison with material from Uruguay, Venezuela, and Europe. The nodosities of the black type are dark brownish to black and very hard, while those of the white form are light brown, the former

being much the more common of the two. Both occur in South America, the black form also in Cochin-China and Java, and the white in Europe and Japan. Black piedra is found on healthy hair, whereas the white type appears to require alterations of the substratum before producing nodosities. The causal organisms of the black and white forms of the disorder are *Piedraia hortai* [R.A.M., xx, p. 203] and *Trichosporon beigeli* [ibid., xvii, p. 600], respectively. Synonyms of the former species are *T. paraguayi*, *P. sarmentoi*, *P. venezuelensis*, *T. venezuelensis* Del Corral, 1934, *P. surinamensis*, *P. colombiana* p.p., and *P. javanica* [ibid., xx, p. 534], while those of the latter (numbering 18) include *T. ovoides*, *T. cerebriforme*, *T. granulosum*, *T. humahuaguensis* [ibid., xviii, p. 526], *P. colombiana* p.p., and *T. minor*.

CONANT (N. F.) & HOWELL (A). **The similarity of the fungi causing South American blastomycosis (paracoccidioidal granuloma) and North American blastomycosis (Gilchrist's disease).**—*J. invest. Derm.*, v, 6, pp. 353–370, 4 pl., 1942.

The writer describes and discusses his comparative studies on eight cultures obtained from cases of South American blastomycosis or paracoccidioidal granuloma (three of which were referred to *Paracoccidioides brasiliensis* and two to *P. cerebriformis*), and seven of the North American form of the disease (*Blastomyces dermatitidis*), isolated from patients at the Duke Hospital, Durham, North Carolina [R.A.M., xx, p. 116; xxi, p. 489]. The media used were Sabouraud's dextrose, beef infusion, beef extract, blood, and glycerine agars, and two series of tests were run, one at room temperature and the other at 37° C. All the strains were tested for pathogenicity by intraperitoneal injections on white mice with 1 c.c. of a 1 : 200 suspension (by volume) of the yeast-like form produced in one-week-old cultures on blood agar at 37°.

All the isolates of *B. dermatitidis* at room temperature exhibited, at one time or another, the three cultural types assigned to this fungus, viz., mealy, prickly, and filamentous. In the early stages of growth, the hyphae intermingled with the single or budding, round, thick-walled elements, 7 to 18 μ in diameter, were broken up into arthrospores, 4 to 6 by 2 to 2.5 μ , but as development proceeded, the growing ends narrowed to 1.5 to 2 μ in diameter, septa appeared at intervals of 10 to 15 μ , and numerous raquette cells, intercalary chlamydospores, and atypical hyphal swellings were observed in the submatrical mycelium: by this time the *Oidium*-like appearance of the colonies had disappeared. The production of aerial mycelium was accompanied by the formation of sessile, round to oval conidia, 3 to 4 μ in diameter, and of a round to piriform type, 4 to 5 μ in diameter, borne on lateral sterigmata of varying length. Round to piriform chlamydospores, 7.5 to 18 μ in diameter, with thick, sometimes wavy, peculiarly sculptured walls reminiscent of *Scedosporium*, developed in profusion in old cultures.

On transference to the incubator, the cottony, aerial growth of the room-temperature cultures became either smooth and waxy or cerebriform and wrinkled. The yeast-like, budding forms of the fungus were accompanied by short, thick-walled, square-ended cells of the *Oidium* type, occurring singly or in chains of three or four. The process of conversion from the filamentous to the yeast-like type of growth was followed microscopically in Van Tieghem cell cultures inoculated with the mycelial form and incubated at 37°.

B. brasiliensis (the name applied to the various South American strains) was characterized in the early stages of growth at room temperature by cerebriform colonies, which subsequently became covered with a short, aerial, filamentous, white to light brown growth. Many round to piriform, thick-walled budding forms, 3 to 25 μ in diameter, were present at first, and the mycelium was composed of thick-walled cells, 4 to 7 by 2 to 3 μ , which readily dissociated into arthrospores. In older cultures numerous intercalary and terminal chlamydospores and atypical hyphal swellings were produced by the submatrical mycelium, while round to

piriform, sessile conidia, 3 to 25 μ in diameter, developed on the short aerial mycelium.

At 37°, five of the South American strains consisted mainly of round, multiple budding cells, with a few short, moniliform chains of two to five cells, while in the other two strains the relative proportions were reversed; the buds produced on the surface of the large, thick-walled cells were round to oval, 1 to 15 μ in diameter, or bacilliform.

The differences observed in the cultural development and clinical behaviour of the North and South American blastomycoses are considered to be of specific rather than of generic importance. *B. dermatitidis* is retained (pending the general acceptance of a more appropriate name) for the agent of the North American disease, and the various designations proposed for the South American granuloma relegated to synonymy with *B. brasiliensis*.

WARE (W. M.) & GLASSCOCK (H. H.). **Flax rust.**—*J. Minist. Agric.*, 1, 1, pp. 16-18, 1943.

During the spring and summer of 1942, flax rust (*Melampsora lini*) was observed in Kent and Sussex, over half the acreage under the crop being affected in the former county and some of the stands so severely damaged as to be useless for scutching; these were rejected by the factories. Infection is perpetuated through the seed, farm debris, and by-products of manufacture, such as 'chaff', consisting of fragments of the seed bolls, flower stalks, and main stems, poorly germinating and 'tail' seed (used for cattle cake), 'shives' (bits of stem, fibre, and root serving as manure), and dust, employed as a 'conditioner' for fertilizers. Control should therefore be based on the use of clean seed and the avoidance of contact between the site selected for the next season's crop and such sources of infection as the harvested stand (commonly stacked on the farm, sometimes for many months, until required for scutching), and the above-mentioned by-products. Other measures tending to reduce the incidence of rust include crop rotation and early sowing (first week of April in the south of England).

Since the outbreak of war the area under linseed has been widely extended, and the straw and chaff of this variety of flax, the former used for bedding and later as manure, and the latter for fodder, also constitute important sources of contamination for the fibre crop. Another risk of propagation of the rust lies in the presence in or near the fields of 'volunteer' flax plants, which may well act as annual hosts, enabling the organism to pass to cultivated crops in the vicinity. On 20th January, 1943, for instance, self-sown seedlings on a Kentish farm were found to bear uredo pustules. *Linum catharticum*, a common field weed, is not susceptible to the physiologic race of *M. lini* attacking cultivated flax.

ADAM (D. B.) & STOKES (JOAN). **The association of *Rhizoctonia bataticola* with retting Flax in South Australia.**—*Proc. Linn. Soc. N.S.W.*, lxxvii, 5-6, pp. 313-317, 1942.

A sclerotial fungus, the morphological, physiological, and pathological characters of which correspond with those of *Rhizoctonia bataticola* [*Macrophomina phaseoli*], has been observed to be widespread at the Waite Agricultural Research Institute, Adelaide, and elsewhere in South Australia, on flax maintained at a temperature of 80° to 90° F. for retting. The organism is also present, though not in such abundance, on flax undergoing 'dew-retting' in the field. Its vigorous development rapidly induces 'over-retting' and impairs the quality of the fibre.

On Dox's and potato dextrose agars the diameter of the sclerotia ranged from 63 to 165 (mean 97) and 50 to 181 (113) μ , respectively. The most rapid increase in colony diameter (49 mm. in 24 hours) took place at a temperature of 32.5° C. Dextrose was shown to be the best source of carbon, closely followed by xylose,

while pectin, cellulose, and starch were also utilized, though less extensively. In a series of cultures on a modified synthetic cotton root agar medium [*R.A.M.*, xviii, p. 249], the hydrogen-ion concentration of which was adjusted to range from P_H 3.4 to 10.6, growth was about equally luxuriant from 5 to 8, at 3.4 it fell to a quarter, and at 10.6 to half the optimum. As in the experiments carried out by Taubenhaus (*Phytopathology*, iii, pp. 159-166, 1913), the writers' strain of *M. phaseoli* produced 'charcoal rot' of sweet potatoes incubated at 25° for four weeks.

The fungus is believed to be a natural occupant of some, possibly many, South Australian soils.

FLOR (H. H.). Chlorotic dieback of Flax grown on calcareous soils.—*J. Amer. Soc. Agron.*, xxxv, 4, pp. 259-270, 3 figs., 1943.

Chlorotic die-back of flax is a non-parasitic disease prevalent in certain unproductive soil areas in the Red River Valley of North Dakota. The leaves formed on the primary stem during cool, wet weather are acutely chlorotic, and if the adverse conditions persist for several days the terminal bud is killed and the stem dies back to the cotyledonary node, from which lateral branches are sent out, except in severe cases when the entire plant succumbs. With the advent of warm weather many of the plants recover and produce a certain amount of seed. If the soil is dry during a cool period, there is little chlorosis, but the cotyledons assume a greenish-bronze cast and the whole plant presents a pinched appearance, the stunted leaves developing necrotic flecks, which expand and lead to premature defoliation.

When Bison flax is grown experimentally in soils representing successively deeper layers, the symptoms are mildest in the surface soil and increase in severity with each lower horizon. No indication of the presence of a toxic substance in the unproductive areas could be detected on the basis of chemical tests, or from a comparison of the growth of plants in steamed or leached and untreated soil. Of the various mineral amendments applied to the 0 to 6 and 7 to 12 in. horizons of Fargo clay soil in greenhouse tests, sodium dihydrogen phosphate (840 lb. per acre) and, to a lesser extent, sodium nitrate (400 lb.), were the only ones that improved the growth of the plants, presumably by correcting the unproductive tendency of the soil.

The chlorotic phase of the disease was more noticeable in the wetter soils, but stunting, foliar necrosis, and stem die-back were equally prevalent at lower water-holding capacities. The symptoms were most acute at low soil temperatures, and showed a progressive diminution in intensity from 12° to 25° C. Applications of phosphate to Bearden silt loam corrected its unproductiveness and the chlorotic condition of the flax plants, similar treatment of the Fargo clay being less effective. It is suggested that the trouble at low soil temperatures is at any rate partially due to the deficiency or unavailability of essential minerals, notably phosphate, in the highly calcareous alkaline soil.

D'OLIVEIRA (MARIA DE L.) & CABRAL (R. V. DE G.). Doenças bacterianas das plantas diagnosticadas em Portugal. [Bacterial diseases of plants diagnosed in Portugal.]—*Rev. agron., Lisboa*, xxx, 2, pp. 176-184, 7 figs., 1942.

Particulars are given of the writers' studies on some bacterial plant diseases in Portugal [*R.A.M.*, xviii, p. 825; xxi, p. 243] in connexion with which the following points may be mentioned. *Bacterium ligustri*, first observed on privet in various Lisbon parks and gardens in 1936 (*Rev. agron., Lisboa*, xxiv, pp. 425-435, 1936), differs from the closely related *Phytomonas* [*Pseudomonas*] *syringae* in its action on milk and sugar-fermenting capacities. Inoculation experiments with *P. syringae*, the agent of a lemon rot of commercial importance, gave positive results on wounded

fruits of the same host, sweet and sour oranges, pear, peach, and tomato, as well as on bean [*Phaseolus vulgaris*] pods, and on lily, sweet and sour orange, lime, apricot, and peach plants.

Comparative studies were carried out on *Bact. (Phytophthora) [Xanthomonas] begoniae*, the agent of *Begonia tuberosa* leaf spot at Cintra, *P. flava-begoniae*, originally described by Wieringa from Holland [*R.A.M.*, xvii, p. 749], and *Bact. [X.] flavo-zonatum* from the United States [*ibid.*, xviii, p. 740], the results of which indicated that a single species is involved in the causation of a disease expressed by a variety of external symptoms dependent on environmental conditions.

DIMOCK (A. W.). **Controlling Septoria leafspot of the Chrysanthemum.**—*Bull. Chrysanth. Soc. Amer.*, x, 1, pp. 6–11, 1942. [Mimeographed.]

In amplification of an abstract of investigations on the control of *Septoria* leaf spot of chrysanthemums [*R.A.M.*, xxii, p. 24, stated by the author *in litt.* to have been carried out with *S. obesa* (*ibid.*, vii, p. 244), while *S. chrysanthemella* is being studied], the following information on the life-history of the former fungus may be presented. The pathogen overwinters on diseased leaves left on the ground in the autumn, its spores being disseminated by splashed or wind-blown water or by mechanical transfer on workmen's clothing, tools, and the black cloth covering over the plants when the foliage is wet with rain or dew; they may be splashed upwards to a height of 16 or 18 in. The host tissues are penetrated almost exclusively through the lower leaf surfaces, at least 24 hours' contact with which is a necessary preliminary to the entry of the fungus, while an incubation period of 10 to 14 days elapses before the appearance of the symptoms, this in its turn being followed in four to six days by the production of a new crop of spores.

DIMOCK (A. W.). **Coming up-to-date on Verticillium wilt and Septoria leafspot of Chrysanthemum.**—*Bull. Chrysanth. Soc. Amer.*, xi, 1, pp. 3–10, 1943. [Mimeographed.]

Virtual immunity from *Verticillium* wilt in chrysanthemums may be secured [*R.A.M.*, xx, p. 247] by the use of so-called 'cultured stock', i.e., shoots from rogued stock plants, surface-sterilized slices of which have been grown for a minimum period of ten days on sterilized agar in Petri dishes to determine the presence or absence of the pathogen. Each dish is occupied by only one slice and is labelled with a designation corresponding to that affixed to the shoot. The shoots demonstrated by this procedure to be free from the fungus are retained and rooted in sterilized soil for further use as stocks, while diseased material is discarded. That the treatment does not completely eliminate the organism is shown by the recurrence of infection among 'cultured' stocks replanted in old contaminated soil. Thus, on sterilized soil, only 6 per cent. of 'cultured' stock of the highly susceptible E. A. Seidowitz variety had to be rogued out, whereas over 50 per cent. of the 3,000 plants on unsterilized soil were rendered unmarketable by the disease. It remains to be seen whether the advantages derived from this somewhat complicated method justify the expense entailed in the provision of the necessary equipment and other facilities, training of personnel, and so forth.

In further tests in 1942 on a number of materials for the control of *Septoria* [*obesa*: see preceding abstract], 4–4–100 Bordeaux mixture, plus Du Pont (formerly known as Grasselli) spreader-sticker at 1 in 2,000, again gave excellent results, fully equal to those previously obtained with the 8–8–100 concentration; the same fungicide may be used at a strength of 2–2–100 for the later applications or during hot, damp weather when the risk of spray burn is greatest. Fermate, 1 or 1½ lb. per 100 gals. plus Du Pont spreader-sticker at 1 in 2,000, also gave remarkable control, reducing the incidence of mortality from 76 to 4 per cent., the comparable figure for Bordeaux being 7. Further experiments with this preparation are recommended,

the suggested strength for early and late treatments being 1 and $\frac{1}{2}$ lb., respectively, with an admixture of the spreader at 1 in 4,000. Some of the fungicides which appeared promising in the 1940-1 trials, e.g., C-O-C-S spray, cuprocid, and fungisul, were less effective under the much more exacting conditions of 1942.

KOTTHOFF (P.). **Der rote Brenner der Amaryllis.** [Scorch of *Amaryllis*.]—*Kranke Pflanze*, xix, 11-12, pp. 106-107, 4 figs., 1942.

Amaryllis vittata [*Hippeastrum vittatum*] hybrids are stated to have been extensively infected by scorch (*Stagonospora curtisii*) [*R.A.M.*, xviii, p. 572] in western Germany and elsewhere after the first world war, and the writer has recently observed a recrudescence of the disease in Westphalian nurseries. Its symptoms and the life-history of the causal organism are briefly described in semi-popular terms. Control presents difficulties, since the pathogen overwinters in the bulb and thence passes to the inflorescences or leaves. Infection may also be conveyed to healthy plants by splashing water or insects, the germ-tubes entering the host tissues through the stomata. The fungus is sensitive to desiccation, and in the writer's experiments spores kept in a dry state were no longer viable after a fortnight, while those freshly emerged from the pycnidia germinated only at a high relative humidity (over 71 per cent.). A saturated atmosphere and a temperature of 22° to 24° C. form an ideal combination for the development of *S. curtisii*, and control measures should be based on the provision of a comparatively low temperature and dry air.

HARDISON (J. R.). **The occurrence of amphispores in the leaf rust of Bluegrasses.**—*Mycologia*, xxxv, 1, pp. 79-82, 2 figs., 1943.

Abundant development of amphispores was observed in 1941 in the uredosori of *Puccinia poae-sudeticae* on a single nursery row of *Poa pratensis* plants grown at the Botanical Garden of the University of Michigan. This is stated to be the first record of amphispores in this rust. The amphispores are described as minutely echinulate, 19 to 23 by 21 to 28 μ , the wall 1.7 to 2.6 μ thick, with six scattered pores, and with the pedicel generally persistent, colourless, once to twice the length of the spore. The amphispores failed to germinate at maturity, but when placed in cheesecloth bags out of doors in October, 2 per cent. of them germinated in February, and 15 to 20 per cent. in April of the following year. When seedlings grown from seed of the same collection of *P. pratensis* on which amphispores were originally collected were inoculated with amphispores, uredosori developed after seven days, but no amphispores were present 26 days after inoculation. The abundant capitate paraphyses accompanying the uredosores provided unmistakable evidence of the connexion of the amphispores in the life-history of *Puccinia poae-sudeticae*. Amphispores were not observed on other collections in the same nursery or on a large number of specimens of the rust collected throughout Washtenaw County, Michigan. It is suggested that the production of amphispores might be related to the physiology of the host plant peculiar to the single grass collection.

ANDREWS (E. A.). **Seedling blight and root rot of grasses in Minnesota.**—*Phytopathology*, xxxiii, 3, pp. 234-239, 1943.

From 1,500 seeds of 11 species of grasses *Helminthosporium*, *Alternaria*, *Fusarium*, *Cladosporium*, and *Penicillium* spp., and a number of unidentified fungi and bacteria were isolated on acid potato dextrose agar at the Minnesota Agricultural Experiment Station. *H. sativum*, isolated from *Bouteloua gracilis* roots, caused severe pre-emergence killing, reduction of root development, and stunting of *Agropyron cristatum* and *Bromus inermis* in the greenhouse, while *Pythium graminicola* from *A. cristatum* roots induced comparable symptoms on the same two hosts at soil temperatures ranging from 12.3° to 31.5° C. The reduction of stand due to

P. graminicola was not so heavy as that resulting from infection by *H. sativum*, while a species of *Fusarium* and *Rhizoctonia* [*Corticium*] *solani*, also isolated from *A. cristatum*, were of only moderate virulence and non-pathogenic, respectively. *P. graminicola* was responsible in greenhouse tests for severe pre- and some post-emergence killing of 14 species of grasses, including *A. pauciflorum*, *A. smithii*, *Andropogon furcatus*, *A. scoparius*, *Elymus canadensis*, and *Panicum virgatum*.

RICHTER (B.). **Der Einfluss des Stengelbrenners auf den Wuchs und Ertrag der Serradella.** [The influence of anthracnose on the growth and yield of Serradella.]—*Kranke Pflanze*, xix, 9–10, pp. 86–91; 11–12, pp. 101–105, 1 graph, 1942.

This is a discussion of the effects of anthracnose (*Colletotrichum trifolii*) on the growth and yield of serradella [*Ornithopus sativus*], and on the relation of cultural practices, especially time of sowing, to the development of infection. As already shown by Hay *et al.* [*R.A.M.*, xvii, p. 754], the postponement of sowing until 10th to 15th June obviates the risk of infection, but it is pointed out that the yields of such late crops tend to fall below the average, so that the provision of a supporting crop is advisable. Stephan (*Mitt. Landw., Berl.*, xxviii, p. 632, 1938) has shown that serradella is capable of assimilating exceptionally large amounts of potash with beneficial effects on production. The crop thrives in soils with a slightly acid reaction (P_H 5.2 to 5.5).

HADORN (C.). **Der Schorf und seine Bekämpfung. Weitere Untersuchungen über die Vorratsspritzung. Untersuchungen über die Wirkungsweise verschiedener Spritzbeläge auf die Keimung der Sommersporen des Apfelschorfpilzes. Neue Grundlagen für die Bekämpfungsmassnahmen.** [Scab and its control. Further investigations on the 'reserve spray'. Investigations on the mode of action of various spray coverings on the germination of the summer spores of the Apple scab fungus. New bases for control measures.]—*Schweiz. Z. Obst- u. Weinb.*, lii, 6, pp. 156–171, 204–232, 9 figs., 8 diags., 1 graph, 1943.

Further investigations on various aspects of the apple scab [*Venturia inaequalis*] control problem in eight climatically divergent regions of Switzerland [*R.A.M.*, xxi, p. 375] led to the following main conclusions. All the experiments revealed the paramount importance of a quick repetition of the pre- and post-blossom treatments. The flowering period is critical, and two pre- and two post-blossom applications at 10- to 14-day intervals should be given wherever possible, especially in the case of varieties liable to infection at a very early stage, such as Gravenstein, Kassel, and Landsberg [Reinettes], Stäfer Rosen, Sauergraeuch, and Beauty of Boskoop. Effective control of early scab is likewise the best preventive of storage infection.

During the three experimental years the best results were given by the 'maximum' (eight-spray) schedule, while the 'normal' (five applications without copper) was also reasonably satisfactory for dessert and keeping apples. Adequate control was further obtained with a schedule ('normal' with copper) in which copper oxychloride was mixed with the lime-sulphur spray in order to dispense with two blossom treatments, but in spite of its great technical advantages this procedure is considered to entail undue risks.

Pomarsol was shown both by laboratory and orchard trials to possess outstanding fungicidal properties. Like Bordeaux mixture, its active principle goes into solution and confers protection on the still untreated foliage merely by dripping from the crown; in this respect pomarsol is superior to lime-sulphur, but its adhesiveness must be increased before it can be applied for treatments at long intervals, e.g., against late scab.

The 'reserve spray' is considered to be the sole effective means for the simplifica-

tion of the summer spray schedule, but the physico-chemical attributes of the mixture still leave room for improvement. There is, for instance, a wide gap between the amount of copper in the accumulated reserve (covering) of a 4 per cent. Bordeaux mixture (1,000 gm. metallic copper in 100 l.) and the minimum effective concentration of 0.1 gm. metallic copper in 100 l. dripping water. Unduly large amounts of copper are washed off in the early stages of contact with the foliage, and this often results in severe damage to the young leaves, besides appreciably curtailing the duration of the protective effect of the covering on the exposed portions of the crown. Bordeaux mixture remains, however, the most practical 'reserve spray'. The fact that Kassel Reinette, Champagne, and Bell apples remain perfectly free from infection under the protection of impregnated nets or matting, even though the copper content of the dripping water sinks below 0.1 gm. per 100 l. by the end of May (C. Zäch's analyses [cf. *ibid.*, xxi, p. 376]), is interpreted as proof that (a) the risk of infection in these varieties begins very early and is of brief duration, and (b) secondary infections do not occur in the absence of primary ones: in other words, no late without early scab.

In preliminary laboratory tests carried out at the Wädenswil Experiment Station to determine the relative merits of the 'film' and 'drop' spray coverings in the inhibition of conidial germination in *V. inaequalis*, the former was found to afford better protection, irrespective of the chemical composition of the fungicide, but the formation of a 'film' makes very exacting demands on the suspensory capacity, fineness, moistening property, and adhesiveness of the mixture, the first-named attribute being decisive for its uniform distribution. A coating of this kind can only be obtained by spraying so thoroughly that the entire leaf, fruit, and branch surface is completely moistened. A sealed and unbroken 'film' is essential to the efficacy of preparations with little or no 'distance effect', such as lime-sulphur plus iron sulphate or copper oxychloride, and copper carbonate. In the case of fungicides of the pomarsol or 2317W. type, with a superior 'distance effect', a few gaps in the interior of the crown are of less importance, since the dripping water distributes the active principle from leaf to leaf as long as reserves are available. A spray pressure of 12 atmospheres at the nozzle of the tube, with an aperture 1.3 to 1.8 mm. in diameter, was found to produce the rapid and thorough distribution of the fungicide necessary for 'film' formation, and the use of apparatus producing a fine 'mist' is not indicated.

LOEWEL (E. L.) & SEEMANN (F.). **Das Verhalten der Bienen gegenüber den gebräuchlichen Spritzmitteln des Obstbaues.** [The reaction of Bees to the orchard sprays in everyday use.]—*Forschungsdienst*, xii, pp. 75-87, 1941. [Abs. in *Chem. Zbl.*, cxiii (i), 1, p. 99, 1942.]

In tent experiments in the Jork district [Schleswig-Holstein] from 1937 to 1940, copper chloride sprays [for apple scab (*Venturia inaequalis*) control] were completely non-toxic to bees, whereas home-made Bordeaux mixture caused heavy losses among workers [*R.A.M.*, xxii, p. 140]. Lime-sulphur mixtures were entirely innocuous, and so was pomarsol alone, but the latter in conjunction with copper oxychloride was definitely injurious. Crude nicotine was harmful only to bees brought into direct contact with it. Arsenic was the most deadly bee poison. The data secured from chemical analyses of the collected bees for copper and arsenic agreed with their reactions and mortality rates, so that the results of such tests afford a reliable basis for toxicological calculations. The lethal doses of copper and arsenic were computed at 3.6 and 0.23 to 0.5γ per bee, respectively.

COOLEY (J. S.) & LINCOLN (F. B.). **A disease of Apple grafts and layers caused by a *Rhizoctonia*.**—*Phytopathology*, xxxiii, 3, pp. 255-257, 1 fig., 1943.

A species of *Rhizoctonia*, possibly *R. [Corticium] solani*, was consistently isolated

from the margin of dead and living tissue of active lesions on the young underground stems of apple grafts or layers at the United States Bureau of Plant Industry Station, Beltsville, Maryland, and inoculated into young layer shoots with positive results. No previous reference has been found in the literature to a comparable disorder of apple grafts, the symptoms on which resemble those already described in connexion with *C. solani* on holly [*R.A.M.*, xxii, p. 83], but a species of *Rhizoctonia* has been repeatedly isolated by E. A. Siegler (unpublished notes) since 1920 from the roots of apple and peach seedlings, while J. A. Perlberger has reported the occurrence of *R. bataticola* [*Macrophomina phaseoli*] on apple and other nursery fruit trees in Palestine [*ibid.*, xvi, p. 683].

TINDALE (G. B.). Cool storage of Apples and Pears under 'acquisition' 1942.—
J. Dep. Agric. Vict., xli, 1, pp. 47–54, 1943.

A survey of the Victorian apple and pear crop acquired by the Australian Apple and Pear Marketing Board in 1942 and stored in 91 cool stores throughout the State showed, *inter alia*, that Jonathan apples are subject to soft scald and break-down if stored at too low a temperature during the early months. Jonathan apples should be stored at a temperature not below 36° F. until the end of April; during May, the temperature can be safely reduced to 34°, and after this month to 32°. In stores where large quantities of Jonathan apples are received, they should be segregated from other varieties (which keep best at 32° from the start) and stored at these temperatures. If it becomes necessary to fill up a Jonathan chamber with other varieties, the temperatures selected should be those suited to the Jonathan apples. It is inadvisable to store Jonathan apples with pears at pear temperatures (29° to 31°) which are much too low for this variety of apple.

Oiled wrappers (to prevent superficial scald) need to be used with Granny Smith apples only if they are to be kept in storage after August. It is suggested, however, that about 20 per cent. of the Stewart, Cleopatra, Delicious, and Rome crops should be oil-wrapped for keeping after September.

CATION (D.). The rosette mosaic disease of Peach.—*Tech. Bull. Mich. agric. Exp. Sta.* 180, 24 pp., 5 figs., 1942.

Peach rosette has been present in Michigan [*R.A.M.*, xx, p. 480] for upwards of 25 years, during the last ten of which, however, it does not appear to have spread to any extent. Infection persists on certain orchard sites even after the removal of rosetted trees, and new trees transplanted to such sites frequently develop the symptoms of the disease in the second year. Inoculations were successfully carried out by bud-grafting and placing unsterilized soil from an infected area round the roots of trees of several varieties, of which J. H. Hale, South Haven, and Seedlings Nos. 1 and 2 contracted exceptionally marked and readily recognizable symptoms.

Two forms of rosette have been distinguished, one relatively mild, with an incubation period of a year or more, and the other severe, causing infection during the year following inoculation on ten varieties; one young tree, bud-inoculated near the ground at the close of the dormant period developed the symptoms in three weeks. One damson plum in particular was implicated as a carrier of rosette, which was further strongly suspected to be harboured by other damson and Burbank plums and prunes of an unspecified variety. No symptoms had developed on Abundance and Red June plums two years after inoculation.

A few cases were noted in which peach trees reacted most severely the year following budding, after which a gradual decline of virulence ensued. South Haven appeared to be the most susceptible of the varieties used in the tests, followed by Golden Jubilee, Kalhaven, and Halehaven, while some degree of resistance was shown by Oriole and Amber Gem; and Gold Drop withstood the attacks of the virus better than Elberta.

JIRAK (L.). **Über die enzymatischen Vorgänge des Welkens bei jungen belaubten Marillenbäumen.** [On the enzymatic processes involved in the wilting of young Apricot trees in leaf.]—*Gartenbauwiss.*, xvii, p. 18, 1942. [Abs. in *Chem. Zbl.*, cxiv (i), 7, p. 738, 1943.]

'Apoplexy' of young apricot trees, characterized by the sudden wilting of portions of the foliage, was shown by the writer's investigations at the College of Soil Science, Vienna, to be primarily attributable to infection by *Sclerotinia cinerea* [*S. laxa*] and *S. fructigena* [*R.A.M.*, xxii, p. 71]. The pectin-dissolving enzymes of the fungi occur in profusion in the water-conducting vessels of the host, where they cause local constriction or displacement through swelling of the intercellular substance. Methoxylase (pectase) is the principal constituent of the enzyme complex of the pathogens. Wilting was experimentally induced with purified pectase extracts from clover leaves.

LOTT (T. B.). **Transmissible 'twisted leaf' of sweet Cherry.**—*Sci. Agric.*, xxiii, 7, pp. 439–441, 1 fig., 1943.

In 1938, two cherry trees in a commercial orchard in British Columbia were observed to be considerably smaller than other trees of equal age, and to have leaf symptoms not observed before of a kind for which the name 'twisted leaf' appeared to be fitting. Surveys of over 9,000 trees, nearly all of them sweet cherry varieties, in the Okanagan valley between 1938 and 1941, showed that twisted leaf was present on 13 trees in seven widely separated orchards; of the affected trees five showed conspicuous symptoms in nearly every leaf, and were severely stunted. One tree consistently showed definite symptoms in a few leaves, with very little effect on tree growth or vigour. In some cases, twisted leaf symptoms were found in conjunction with symptoms of other diseases. All the affected trees belonged to the Bing variety, except one, which was a Black Republican.

Three definite symptoms consistently appeared, and remained evident throughout the season. All three did not necessarily develop on every leaf, but their combination is not known to occur in any other disease. These were bilateral inequality, distortion, and necrosis. In the case of the first, the smaller side tended to be more chlorotic, with slightly more acute angles between the midrib and the veins, and with more up-and-down waving of the leaf margin. The midrib was occasionally almost straight, but generally was smoothly curved in the plane of the leaf. As regards the second, in some leaves the distal portion was abruptly bent downwards, this abrupt bend being most noticeable on the midrib and least at the leaf margin. Sometimes the bend was slight, at other times it exceeded a right angle. Similar bends occurred at the union of the blade and petiole or at a point along the petiole. The petioles were variously bent and twisted. The leaf margins often showed a marked up-and-down wave and sometimes were buckled. A bend was generally associated with necrosis of part of the midrib. This was either restricted to the lower surface of the vein, or it occurred on one or both sides. When it spread to the upper surface part of the midrib usually dropped out, as did bits of the lateral veins. Petiole necrosis was, as a rule, more superficial than midrib necrosis.

Other symptoms were also noted. In all trees, affected leaves were small. Severely affected trees showed symptoms not found in slightly affected ones; they were stunted, and the internodes, particularly those on the lateral branches, were shortened, while occasionally, severe defoliation from the base was noted. Leaves sometimes occurred in tufts or clusters, many with blades under 2 in. in length. Two kinds of mottling were also present: a peppering of small yellow spots, generally with minute brown centres, and (less often) short, bright yellow lines near some of the lateral veins. The crops were sometimes reduced and of poor quality.

The condition was experimentally transmitted to all of nine young Bing trees budded or grafted with material from affected trees, symptoms appearing in two months or more. Transmission gave rise to milder forms of the disease.

HUNTER (A. W. S.). **Rust resistant Black Currants.**—*Canad. Hort.*, lxvi, 1, p. 10, 1 fig., 1943.

Very promising results in respect of resistance to white pine blister rust [*Cronartium ribicola*] have been secured during the last two years at the Central Experimental Farm, Ottawa, by crossing a wild black currant from Manchuria with certain commercial varieties. One of the resultant seedlings shows special promise, combining heavy cropping and other desirable features with complete freedom from disease, and it is expected that supplies will shortly be available on the market. Many of the hybrids appear also to be only slightly susceptible to powdery mildew [*Sphaerotheca mors-uvae*].

ZELLER (S. M.) & BRAUN (A. J.). **Decline disease of Raspberry.**—*Phytopathology*, xxxiii, 2, pp. 156–161, 3 figs., 1943.

Large areas of Cuthbert red raspberry plantings in the Willamette Valley of western Oregon are stated to be running out as a result of infection by a graft-transmissible virus, for which the name *Minuor ruborum* or *Rubus* virus 8 is proposed, the disorder itself being termed decline disease. No marked specific features characterize the disease, which causes a gradual diminution in the vigour of canes and roots, accompanied by some leaf-rolling and fluting, the latter symptom being apparent throughout the season on greenhouse plants but only in the late autumn out of doors. Since plant selection has given satisfactory results in the elimination of a bud-perpetuated disease known locally as 'crumbly berry', it is planned to test the certification of planting stock as a control measure against decline.

ZELLER (S. M.) & BRAUN (A. J.). **Stamen blight of Blackberries.**—*Phytopathology*, xxxiii, 2, pp. 136–143, 3 figs., 1943.

The most serious case of stamen blight (*Hapalosphaeria deformans*) observed by the writers in Oregon [*R.A.M.*, xix, p. 31] involved some 70 per cent. of Young dewberry blossoms in a six-acre commercial planting in 1937; by the following year the incidence of infection had sunk to 15 per cent., and since then up to 30 per cent. has been reported on one occasion, so that epidemiology of the pathogen is evidently much influenced by seasonal conditions. The Boysen dewberry and Evergreen blackberry are also susceptible. The diseased anthers, unlike those of healthy flowers, do not dehisce to expose cream-coloured pollen but are covered with the white spore horns of the fungus. Berry production by the emasculated blossoms is dependent on accidental pollination by bees, and the deformed fruits obtained in this manner are usually unsuitable for canning. Entry into the host is effected through the anther walls, the pollen sac being completely surrounded by a pseudoparenchymatous envelope, the pycnidia formed on which erupt on the surface in readiness to discharge coils of pycnospores when the flowers open. Infection takes place through the axillary buds some time between May and the following March. No perfect stage of the fungus has been discovered. Dormant sprays of Bordeaux mixture or lime-sulphur were ineffectual, but about 60 per cent. control was secured by the application of lime-sulphur (4 per cent. of 32° Baumé) in August, 1941.

ROY (T. C.). **A root-rot disease of Mulberry plants (*Morus alba* L.).**—*J. Indian bot. Soc.*, xxii, 1, pp. 27–35, 1 fig., 3 graphs, 1943.

Diplodia morina was isolated at the Bengal Agricultural Institute, Dacca, from the roots of mulberry plants showing a light brown stain, gradually deepening to

dark brown or black, which was accompanied by wilting of the aerial portions and defoliation. By inoculation experiments with pure cultures of the fungus from a synthetic agar medium containing glucose and peptone, entry into the host was shown to be effected through the epiblemma, whence the intercellular spaces of the cortical tissue system were traversed and the phloem reached. From the last-named region the hyphae travelled upwards and downwards, some protruding into the xylem vessels through the pits in the manner of tyloses. The minimum, optimum, and maximum temperatures for the growth of *D. morina* were found to be 12°, 35°, and 40° C., respectively, and a hydrogen-ion concentration of P_H 7.6 was conducive to vigorous development.

CHATTERJI (N. K.). **Anatomical studies in a necrotic Papaya (*Carica papaya*, L.) plant.**—*J. Indian bot. Soc.*, xxii, 1, pp. 41–50, 1 pl., 11 figs., 1943.

Full details, based on an intensive anatomical study, are given of the pathological changes in the latex vessels, secondary phloem, and cambium of a papaw plant of the Ceylon variety suffering from a foliar disease, presumably of virus origin, the external symptoms of which included hypertrophy, hypoplasia, malformation, the production of numerous secondary large veins, and the formation of papilla-like excrescences on the areas of the leaf blade bordering the veins.

WAGER (V. A.). ***Phytophthora cinnamomi* and wet soil in relation to the dying-back of Avocado trees.**—*Hilgardia*, xiv, 9, pp. 519–532, 3 figs., 1942.

Further work on the decline of avocado trees associated in southern California with *Phytophthora cinnamomi* [*R.A.M.*, xxi, p. 149] and excessive moisture showed that other fungi present on the roots of affected trees were *Pythium vexans*, *P. ultimum* (on one root), *Fusarium oxysporum*, and *Cylindrocarpon radicumicola*. Inoculation tests with *P. vexans* indicated that this fungus grows only in weakened or dead roots, or those already infected by *Phytophthora cinnamomi*. No tests were made with *F. oxysporum* or *C. radicumicola*, but they, probably, are no more injurious than *Pythium vexans*.

This is stated to be the first record of *Phytophthora cinnamomi* on avocado in the United States, though the fungus has also been recorded on this host in South Africa and Puerto Rico [*ibid.*, ix, p. 291].

KLOTZ (L. J.) & SOKOLOFF (V. P.). **The possible relation of injury and death of small roots to decline and collapse of Citrus and Avocado.**—*Calif. Citrogr.*, xxviii, 4, pp. 86–87, 6 figs., 1943.

Decline and collapse of citrus and avocado trees in California are, respectively, gradual die-back with leaf-yellowing accompanied by low yield, and rapid wilting followed by death, and are caused by the destruction of feeder roots. In August, 1940, *Phytophthora citrophthora* and *P. parasitica* were isolated from feeder roots of the sour orange stock of a Washington Navel orange tree that had wilted and from injured feeder roots of apparently healthy trees in the vicinity. They were also obtained from a large number of citrus trees, some healthy, in different localities, and *Pythium ultimum* and *Fusarium* spp. were also found. The two former fungi were shown by greenhouse experiments to be capable of attacking and destroying feeder roots of sweet and sour orange seedlings at temperatures ranging from 10° to 30° C.; at 25° and 30° growth was more vigorous and decline slower. Infection experiments with zoospore suspensions of *Phytophthora* spp. on grapefruit, rough lemon, Valencia, and sour orange showed all to be susceptible, whereas Sampson tangelo was outstanding in its resistance. Plants with fibrous roots extensively infected with *P. parasitica*, removed from an infected seed-bed to well-aerated soil in a warm greenhouse, recovered. The rate of production and growth of active roots is believed to be the important consideration.

Decline and collapse in avocado have been shown by Tucker [*R.A.M.*, ix, p. 291] to be associated with *P. cinnamomi* and result from the destruction of the roots. Greenhouse and current field experiments indicate that toxic materials produced during the denitrification induced by conditions of poor aeration and drainage may be responsible for the injury and death of the roots, and for predisposing the roots to attack by *P. spp.* and other fungi. Soil saturation during the rainy season and the presence of organic matter and nitrites in suitable proportions may result in sufficient concentration of toxins to injure roots severely and cause the death of the trees in the subsequent dry weather.

Toxins produced during denitrification were also found to injure or kill citrus roots, and predispose them to attack by parasitic fungi. *P. cinnamomi* and *P. parasitica* are active denitrifiers. In the early stages of nitrite injury, absorption of water by roots is greatly reduced.

It is assumed that in commercial groves the brown-rot fungi are generally present and may take part in root destruction, their action being perhaps supplemented by secondary *Fusarium spp.*

MARTIN (H.). **The evaluation of fungicides. A study in quantitative toxicology.**—*J. Soc. chem. Ind., Lond.*, lxii, 5, pp. 67–71, 1943.

This is a critical survey and discussion of recent researches on the application of bio-assay and physico-chemical methods to the evaluation of fungicides, reference to which has been made from time to time in this *Review*.

STARKEY (R. L.) & WAKSMAN (S. A.). **Fungi tolerant to extreme acidity and high concentrations of copper sulphate.**—Abs. in *J. Bact.*, xlv, 2, p. 196, 1943.

From acid solutions (P_H 0.2 to 0.7) containing 4 per cent. copper sulphate were isolated two fungi, one of which was identified as *Acontium velatum* Morgan (a close relative of *Cephalosporium*), while the other, a dark green member of the Dematiaceae, could not be more closely determined in the absence of true spores. Both organisms thrive in a synthetic medium with hydrogen-ion concentrations ranging from P_H 0.3 to 1, limited development being made even at 0.1 (0 in the case of the green fungus). The presence of copper sulphate in amounts sufficient to produce saturation of the medium did not impede the growth of the moulds within a range of P_H 0.3 to 2, a modicum of development also occurring at 0. The two fungi under observation are believed to show the greatest tolerance of the combined effects of high concentrations of copper sulphate and extreme acidity yet recorded.

LÖHNIS (MARIE P.). **Histology of symptoms of boron deficiency in plants.**—*Meded. LandbHoogesl. Wageningen*, xlv, 3, pp. 3–36, 1940. [Abs. in *Chem. Abstr.*, xxxvii, 8, p. 2043, 1943.]

The influence of boron deficiency on the anthers was studied from the histological standpoint in water cultures of wheat, oats, and barley. The sporogenous tissue was found to be particularly sensitive to the absence of boron. The primary injury appeared in the cell nucleus, where division was inhibited in the early stages of the shortage. At a later phase, however, cells of varying size and shape were formed. The normally high boron content of the pollen of the cereals tested is considered to explain the acute sensitiveness of the sporogenous tissues to the lack of this element.

In the swede, the first symptom of boron deficiency was the development of a wide zone of thin-walled cells from the cambium and phellogen. The initial damage to the cell walls was observed in the secondary vascular bundle, followed by the formation of thick-walled cells distinct from all the adjacent tissues. As in the case

of the cereals, the state of development at which the boron deficiency occurred determined the nature and extent of the trouble.

CHESTER (K. S.). **The nature and prevention of plant diseases.**—xii+584 pp., 196 figs., 7 diag., 4 graphs, Philadelphia, The Blakiston Company, 1942. \$4.50.

The scope of this treatise and the mode of treatment of the subject-matter have been largely dictated by the needs of the author's students at the Oklahoma Agricultural Experiment Station, for whom an elementary course in plant pathology provides a fitting background for useful agricultural work. The dual purpose of the volume is to introduce the student to the essential features of the science, as exemplified in the major diseases of the leading United States crops, and to furnish him with a book of reference for detailed and specific directions on plant disease control. Emphasis is given to environmental factors, and to the conditions which give rise to epidemics. Following two introductory chapters on the significance of plant disease in agriculture and types of plant disease fungi, chapters 3, 4, and 5 deal with diseases caused by Basidiomycetes (rusts, smuts, fleshy fungi, mycorrhiza); 6, 7, and 8 with those induced by Ascomycetes, Fungi Imperfecti, and Phycomycetes; 9 is concerned with damping-off and related troubles and special attention is given to those diseases which are caused by pathogenic complexes; 10 and 11 with diseases caused by bacteria and viruses, respectively; 12 with those due to parasitic seed plants, algae, and epiphytes; 13 with nematode infestations; 14 with physiogenic diseases; 15, 16, and 17 treat, respectively, of the methods of studying plant diseases, environment and parasitic disease, and the etiology and epiphytology of disease; 18 discusses principles and procedures in the control of plant diseases and various aspects of the quarantine system; while 19 and 20 deal with control by inducing resistance and cultural methods, respectively.

SMITH (R. E.). **Two items of pathological history from California.**—*Phytopathology*, xxxiii, 3, pp. 258-260, 1943.

Attention is drawn to two items of interest in the history of phytopathology antedating the first records given by Melhus and Kent in their recent text-book [*R.A.M.*, xix, p. 110]. Early volumes of *Trans. Calif. agric. Soc.* (beginning with the first in 1858) contain numerous references to the treatment of wheat seed-grain with copper sulphate against bunt [*Tilletia caries* and *T. foetida*], mention of which was also frequently made in *Calif. Culturist* (1858 to 1861). In the new manual 1873 is cited as the first year in which this method of control was applied.

Regarding peach leaf curl (*Taphrina deformans*), the authors of the recent treatise give 1883 as the earliest date mentioned in American literature on the disease, but it is described in various early books on fruit-growing, e.g., Downing's '*Fruits and Fruit Trees of America*' (1845) and was prevalent in California from the middle fifties onwards.

WENT (F. W.). **Plant growth under controlled conditions. I. The air-conditioned greenhouses at the California Institute of Technology.**—*Amer. J. Bot.*, xxx, 2, pp. 157-163, 1 fig., 1 graph, 1 plan, 1943.

A full description is given of a set of air-conditioned greenhouses suitable for plant physiological work in which temperature and humidity can be kept constant or varied as desired. Two independent units, each consisting of a greenhouse and a dark room, are conditioned by two air-conditioning systems, and the plants, which are grown on movable tables, can thus be subjected to a wide range of conditions.

DRECHSLER (C.). **Another Hyphomycetous fungus parasitic on *Pythium* oospores.**—*Phytopathology*, xxxiii, 3, pp. 227-233, 1 fig., 1943.

A full description is given of *Trichothecium arrhenopum* n.sp., an active parasite

of *Pythium de Baryanum* in agar cultures to which small amounts of Wisconsin leaf mould have been added [cf. *R.A.M.*, xvii, p. 476]. The fungus is characterized by massive, crook-necked appressoria, 8 to 18 by 5 to 8 μ , by means of which it penetrates the oogonial envelope and oospore wall of its host. The conidiophores of *T. arrhenopum* are erect, hyaline, usually uniseptate, 25 to 50 (average 34.4) by 1.7 to 2.5 (2.2) and 0.7 to 1.5 (0.9) μ at the base and apex, respectively, and the conidia solitary, hyaline, clavate or elongate to elliptical, uniseptate, 17 to 25 (21.4) by 2.6 to 3.7 (3.1) μ .

MARSH (W. S.) & DUSKE (A. E.). **Mildew proofing military fabrics.**—*Text. World*, xcii, 8, pp. 58–60, 1942. [Abs. in *Chem. Abstr.*, xxxvii, 8, p. 2189, 1943.]

Effective mildew resistance, persisting even after repeated washing, was conferred on military fabrics by treatment with a 1 in 2,000 solution of phenyl mercuric acetate, which did not impair the quality of the material and is both inexpensive and non-toxic.

GANDHI (R. C.) & VENKATARAMAN (K.). **Mildew in Cotton. I. The routine examination of textile antiseptics. II. Estimation of salicylanilide in textiles. III. Synthetical experiments in antiseptics for textiles. Derivatives of Cashew-nut shell oil.**—*J. Indian chem. Soc.*, Industr. & News Ed., v, pp. 75–84, 1942. [Abs. in *Chem. Abstr.*, xxxvii, 8, pp. 2188–2189, 1943.]

The action of antiseptics on cultures of *Aspergillus niger* was investigated by the method of Fargher *et al.* [*R.A.M.*, ix, p. 783], and the most promising compounds evaluated in a second test, in which cotton cloth treated with the various preparations was inoculated with the mould and placed in a moist atmosphere over mildewed water. The most active fungicides were para-chlorophenol, α - and β -naphthol, and salicylanilide and its derivatives.

The amount of the preservative shirlan (salicylanilide) present on a fabric can be estimated by a method based on the fact that the antiseptic will absorb approximately 3 mols. of bromide per mol.

None of the derivatives of cashew nut shell oil tested proved superior as mildew-preventives to those mentioned above.

ROSENDAHL (C. O.). **Some fossil fungi from Minnesota.**—*Bull. Torrey bot. Cl.*, lxx, 2, pp. 126–138, 19 figs., 1943.

A description is given of a fossil fungus obtained from three Pleistocene sites in Minnesota, and belonging to the same group as one described and figured by Butler which was found in glacial clays near Edmonton, Alberta [*R.A.M.*, xviii, p. 469]. The recent forms of the vesicular-arbuscular mycorrhizal fungus were referred to the genus *Rhizophagus*, but the fossil form from Alberta together with the Minnesota forms are assigned to a new fossil genus named *Rhizophagites*, characterized by terminal, ovate, short piriform, or subspherical, yellowish-brown to dark brown vesicles, measuring 46 to 124 by 42 to 103 μ , with walls considerably thicker than the walls of the mature hyphae, vesicles at first in open communication with the hyphae, later occluded by basal plugs or septa at the neck of the stalk or in the stalk or by a second wall forming round the contents; a second vesicle is sometimes formed within by proliferation from the stalk.

The Minnesota material agrees so closely with that from Alberta that it is almost certain that the same species is concerned. This is named *R. butleri* n.sp. while another species of the genus from the early Pleistocene strata in Minnesota is named *R. minnesotensis* n.sp.

BERTRAND (D.). **Importance de l'oligoélément vanadium pour l'*Aspergillus niger*.**

[The importance of the trace element vanadium for *Aspergillus niger*.]—*C.R. Acad. Sci., Paris*, cexiii, 6, pp. 254–257, 1 graph, 1941.

Added to cultures of *Aspergillus niger* on a synthetic liquid medium at a concentration of 4.3×10^{-9} gm. per l., vanadium increased the dry weight of the mould by 20.9 per cent. over that obtained in a control series in which the content of the trace element in the substratum was reduced by purification to less than 10^{-9} gm. per l. Hence it is concluded that vanadium, in such concentrations as are likely to be encountered by the fungus in nature, plays an important part in its physiological development, the minimum quantity necessary to produce the effect described being probably of the order of 2×10^{-9} gm. per l.

NICKERSON (W. J.) & THIMANN (K. V.). **The chemical control of conjugation in *Zygosaccharomyces*. II.**—*Amer. J. Bot.*, xxx, 2, pp. 94–101, 1 fig., 3 graphs, 1943.

Continuing their study of a conjugation-promoting principle from *Aspergillus niger* on *Zygosaccharomyces* [*R.A.M.*, xx, p. 590], the authors describe a simple method for determining within ± 3 per cent. the number of cells conjugating in a given culture. The conjugation-promoting principle in the filtrate from old cultures of *A. niger* was found to be organic and to consist of at least two fractions, neither of which is very active by itself. One has the properties of an organic acid, while the other appears to belong to the vitamin B complex. The effect of the principle can be reproduced by a mixture of riboflavin and glutaric acid.

BURKHOLDER (P. R.). **Vitamin deficiencies in yeasts.**—*Amer. J. Bot.*, xxx, 3, pp. 206–211, 1 fig., 1 graph, 1943.

In this paper the author describes studies carried out on the growth factor requirements of 38 species and strains of yeasts cultured in a chemically defined medium with varied supplements of vitamins and liver extract. The treatments used were (1) without vitamins, (2) without thiamin, (3) without riboflavin, (4) without pantothen, (5) without niacin, (6) without biotin, (7) without inositol, (8) without pyridoxin, (9) with all seven vitamins, and (10) with all seven vitamins plus liver.

Under the experimental conditions 15 yeasts showed marked requirements for thiamin, none needed riboflavin, 14 required pantothenic acid, 6 nicotinic acid, 36 biotin, 4 inositol, and 6 pyridoxin. In all cases growth was increased by the addition of liver extract. The figures for *Candida albicans* may be cited (turbidity units of cultures grown for 72 hours at 25° C.); they were (for the 10 treatments listed above) 15, 61, 124, 126, 126, 6, 129, 125, 115, and 187, respectively. Some of the organisms may be useful in microbiological assays for vitamins.

McKEEN (C. D.). **A study of some factors affecting the pathogenicity of *Verticillium albo-atrum* R. & B.**—*Canad. J. Res.*, Sect. C, xxi, 3, pp. 95–117, 9 graphs, 1943.

Following an epidemic of *Verticillium* wilt in the Niagara Peninsula, Ontario, in 1940, isolates of the causal fungus from diseased barberry, peach, rose, potato, eggplant, muskmelon, and chrysanthemum plants, although found to differ slightly in morphology and pathogenicity, were all referred to *V. albo-atrum*. In greenhouse experiments, the temperature range of heavy disease incidence at the optimum level of soil moisture was from 21° to 27° C. with a sharp peak at 24°, which coincides with the optimum temperature for vegetative growth of the fungus in culture; at high levels of soil moisture, the curve for heavy disease incidence was much broader, from 18° to 29°, and the symptoms appeared slightly sooner. A considerable residual inoculum was found to be still present in the soil in May, 1941,

following the 1940 epidemic. The fungus was shown to persist and to remain aggressive after three months in fine sandy and medium and red clay loam soils, both under cropped and fallow conditions, except when the soil was fallow and dry during the period. The growing of an immune or a susceptible host in infested soils for three months had no noticeable effect upon the survival of the fungus. Inoculum in a resting condition was found incapable of infecting plants unless incorporated in moist soil a few days earlier. The addition of green plant residue or of tartaric or citric acid to the soil slightly lowered the activity of the fungus.

An examination of phenological data during May, June, July, and August for the four years, 1939 to 1942, showed that soil temperatures high enough to permit disease development are not commonly encountered locally before late June, and that for the disease to assume serious proportions high soil moisture must be maintained uniformly during May, June, and July. It is suggested that the relative infrequency of *Verticillium* wilt epidemics on the Niagara Peninsula is probably due to the fact that soil moisture is usually low during that part of the growing season when soil temperatures are high enough to favour the development of the fungus.

SILBERSCHMIDT (K.), NOBREGA (N. R.), & KRAMER (M.). **Sobre as variantes do vírus X das Batatinhas no Estado de São Paulo.** [On the variants of the X virus of Potatoes in the State of São Paulo.]—*Arq. Inst. biol., S. Paulo*, xii, 3, pp. 28–58, 6 pl., 1941. [German summary.]

Seven collections of potato virus X from different parts of the State of São Paulo, Brazil, were compared with each other and with isolates from the United States and Holland by the inoculation of White Burley tobacco, *Nicotiana rustica*, *Datura stramonium*, and other Solanaceous plants. In the light of their exhaustive inoculation experiments—the results of which are fully described and tabulated—the authors divide their nine isolates into two groups, one ‘strong’ and characterized by the necrotic type of symptom, comprising Ca 193/A5 and Ca 53/1 (two undetermined Dutch varieties from Cascata, São Paulo), Majestic (from U.S.A.), and Eigenheimer 1223, and the other ‘weak’, represented by Green Mountain, St. T. (an undetermined variety from Cantareira), Eigenheimer O.S., Ind. 401 (an undetermined variety from Indaiatuba), and Eersteling [Duke of York] (from Holland), of which the two last-named are very unstable, the predominantly chlorotic symptoms characteristic of the weak group occasionally alternating with a restricted production of definite necrosis. The members of the former group are taken to be variants of Salaman’s X^s [*R.A.M.*, xviii, p. 130], while X^L is considered to be the prototype of those constituting the latter.

BALD (J. G.). **The effect of Potato virus X on growth and yield.**—*Aust. J. Sci.*, iv, 6, pp. 177–178, 1942.

Measurements in the field of the leaf area of mature Great Scot potato plants, half of which were virus-free and half infected with a masked strain of potato virus X, showed no difference between the healthy and affected plants. In a field trial of 23 Up-to-Date tuber lines infected with naturally occurring mixtures of virus X, significant yield differences were found to be associated with severity of infection, but no association was observed between growth rate or leaf area at maturity and severity of infection.

To measure the severity of these mixtures quantitatively three greenhouse experiments were made. Inoculations were carried out with each mixture of virus X to *Datura stramonium* and the symptoms rated. In June and the March following measurements were made of the growth of the test plants for six to twelve days after the first appearance of the symptoms; the length of each leaf

was measured, and these lengths compared, on the assumption that the shapes of the leaves were about constant.

In the winter experiment growth was only about half that of the summer-grown plants, symptoms were conspicuous, and there were wide and significant differences in growth between plants infected with different X virus mixtures. In the summer experiment symptoms were rather milder, and the effect of infection on growth was non-existent or small.

In the summer experiment light intensity and temperatures were high, and the conditions favoured rapid photosynthesis and gaseous exchange. The limiting conditions were probably (at least in the pots containing more than two plants) the intake of food materials by the roots or the numbers of respiratory centres in the cytoplasm. In these conditions virus X produced little or no effect on growth. In the winter photosynthesis and gaseous exchange were probably limiting factors, and virus X had its greatest effect on growth. Such results would follow if virus multiplication were a partial substitute for the synthesis of chromo- or chlorophyll protein, and if these portions were stored up beyond the minimum requirements for photosynthesis as inert reserve material.

In potatoes growing in the field near Canberra infection with virus X does not result in mosaic symptoms, and there is probably no loss of chlorophyll or photosynthetic efficiency. Light and temperature are high, lack of moisture and soil fertility being the chief factors limiting growth. Loss in yield may be due merely to the 'freezing' of some of the protein reserves in the form of virus protein, and the inability of the plant to reconvert the virus into substances capable of being translocated and stored in the tuber. Yield differences resulting from infection with milder and more severe strains would then result from the ability of the severe strains to multiply to greater concentrations in the plant than the mild strains.

KIRKPATRICK (H. C.) & BLODGETT (F. M.). **Yield losses caused by leaf roll of Potatoes.**—*Amer. Potato J.*, xx, 3, pp. 53-56, 1943.

The results obtained from a further application of Blodgett's method of determining potato leaf-roll losses [*R.A.M.*, xxi, p. 159] to the Chippewa, Cobbler, and Green Mountain varieties in four counties of New York State in 1942 confirm the view already expressed, i.e., that the healthy hills, adjoined by diseased plants on one side or both, partially compensate for the low yield of the leaf-roll plants. The gain in yield of a healthy plant with a diseased neighbour on both sides is approximately double that of a comparable plant with a leaf-roll plant on one side only. Thus, healthy plants with leaf roll on both sides averaged 16.8 per cent. higher yield than did healthy plants surrounded by healthy ones. Healthy plants with leaf roll on one side only gained 7.9 per cent. The average gains in yield for diseased plants competing with leaf roll on one side (4.2 per cent.) or both (8.1), compared with those having sound plants on each side, were only about half as large as in the case of healthy plants.

HENDRICKX (F. L.). **Le mildiou de la Pomme de Terre.** [Potato mildew.]—*Centre afr.*, xi, 488, p. 3, 1943.

Phytophthora infestans has now been definitely identified on potatoes from Rutshuru and Ruhengeri, Belgian Congo, and has also made its appearance in the neighbouring district of Kigezi, Uganda [cf. *R.A.M.*, xxi, p. 426]. Under the conditions prevailing locally the only possible means of control would appear to be the selection of resistant varieties, some suggestions for which are made.

BOURIQUET (G.). **Contribution à l'étude des altérations de la Vanille préparée (moississures et mite).** [A contribution to the study of alterations in processed Vanilla (moulds and a mite).]—*Bull. Acad. malgache*, N.S., xxiv, pp. 65–77, 4 col. pl., 1 fig., 1941.

Complaints having been received, notably from the United States (the largest purchaser), regarding the spoilage of the processed vanilla exported annually in substantial quantities from Madagascar, the author undertook an inquiry into the nature of the trouble and the factors contributing to its development. The following moulds were isolated on various nutrient media from samples from the east coast of the Island: *Aspergillus niger*, *Penicillium lividum*, *P. vanillae* n.sp., and *P. rugulosum*. *P. vanillae* [of which no Latin diagnosis is given] is characterized by pink colonies shading into various tones of orange, red, blue-green, and transitional tints according to the medium, the optimum temperature for growth ranging from 27° to 38.5° C. On glucose agar the conidiophores measure 3 μ in diameter, the metulae, commonly occurring in groups of three, 12 by 2.5 μ , the sterigmata, also frequently triple, 14 by 2.2 μ , and the rugose conidia 2.5 to 3 by 1.75 to 2.5 μ . Pink coremia are formed on haricot bean decoction agar on the sixth day. Gelatine was not liquefied after 80 days.

Mould damage was most prevalent at the base of the fruits, near the point of attachment to the peduncle, a site comparatively poor in vanillin, and also on fruits plucked before maturity, in which this substance (the monomethylic ether of the protocatechuic aldehyde) is not yet fully accumulated. In germination tests with a 1.5 per cent. glucose solution, plus 0.5 or 1 per cent. vanillin, *P. rugulosum* proved to be the most sensitive of the four organisms, but the growth of all was checked by a 1 per cent. concentration of vanillin in four days.

CROSS (W. E.). **Variedades de Caña importadas. Resultados obtenidos en los últimos años.** [Imported Cane varieties. Results obtained of recent years.]—*Rev. industr. agric. Tucumán*, xxxii, 7–9, pp. 193–271, 1942.

Among the attributes included in this tabulated account of the behaviour under Tucumán (Argentine) conditions of a number of imported sugar-cane varieties are their reactions to certain diseases, including mosaic and smut [*Ustilago scitaminea*].

CROSS (W. E.). **Nuevas observaciones sobre el 'carbon' en las distintas variedades de Caña de Azúcar.** [New observations on 'smut' in individual Sugar-cane varieties.]—*Bol. Estac. exp. agric. Tucumán* 39, 15 pp., 1943.

Discussing the practical applications of further observations on varietal reaction to sugar-cane smut [*Ustilago scitaminea*] in Tucumán [*R.A.M.*, xxii, p. 197], the writer advises the ultimate replacement of the susceptible P.O.J. 36 and its mutants by such virtually immune types as Co. 270, Co. 290, Kavangire, P.O.J. 2725, P.O.J. 2878, Tuc. 1406, and Tuc. 2645. However, the process of substitution must of necessity be carried out step by step, since the supplies of resistant material are still limited, and moreover, not every immune or quasi-immune variety will be suited to all peculiarities of climate: it would be useless, for instance, to plant a delicate cane, however resistant to *U. scitaminea*, in a region subject to intense cold. Pending the completion of the exchange of susceptible for resistant varieties, it may be possible to make use of a number of widely grown sorts which are less severely attacked than P.O.J. 36, e.g., C[anal] P[oint] 29/320, P.O.J. 213, Tuc. 407, Tuc. 472, and Tuc. 1376.

STEVENSON (G. C.). **The present and potential value of Sugar-Cane breeding.**—*Emp. J. exp. Agric.*, xi, 41, pp. 38–48, 1943.

The subject of sugar-cane breeding is discussed under three aspects, namely, the development of the enterprise since its inception in Mauritius in 1891, some of the problems confronting the breeder, and the trends of present-day research in the

accomplishment of varietal improvement. In the last-named connexion mention is made of the discovery that the genes responsible for immunity from mosaic and sereh disease are carried by the chromosomes of *Saccharum spontaneum*. Kassoer, a natural hybrid of this wild species, is immune, and in successive 'nobilizations' of its 'blood-line', P.O.J. 2364, with 28 *spontaneum* chromosomes, is immune, P.O.J. 2878, with about 14 *spontaneum* chromosomes, is sufficiently resistant for commercial purposes, while seedlings of the fourth 'nobilization', with approximately seven chromosomes, are more susceptible to the two diseases in question, though individual variations occur in this respect. These data denote that, in this case, disease resistance behaves as a polygenic character correlated with the number of *spontaneum* chromosomes present.

Another less familiar 'nobilization' series is the Uba-Marot 'blood-line', originating in the 64-chromosome Indian *S. spontaneum*, in which immunity from gumming disease [*Xanthomonas vasculorum*] is associated with the *spontaneum* chromosomes.

SPARROW (F. K.). **Aquatic Phycomycetes exclusive of the Saprolegniaceae and Pythium.**—xix+785 pp., 1 pl., 69 figs., Ann Arbor, University of Michigan Press, London, Humphrey Milford, Oxford University Press, 1943. \$5.00.

In this volume the author is concerned primarily with the groups of Phycomycetes (exclusive of the Saprolegniaceae and *Pythium*, authoritative monographs of which are already available) inhabiting fresh and marine waters [*R.A.M.*, xv, p. 670], although no absolutely hard-and-fast rule can be drawn between the different families on the basis of their aquatic or terrestrial habitats [*ibid.*, xxi, p. 472]. Owing to the scarcity of herbarium specimens of the group under consideration, and the inadequacy of the data obtainable from the few that do exist, most of the studies for the present monograph were carried out in the laboratory on living material. The annotated taxonomic treatment of the groups is in the main conservative, and no species has been relegated to synonymy where any doubt as to its validity remains. Geographical citations have presented some difficulty due to the changing political situation, and readers are warned that for the purposes of the treatise Austria and Czechoslovakia are included under 'Germany'.

Following an introduction dealing with the phylogeny and relationships, occurrence and geographical distribution, collection, isolation and culture, and preservation of the aquatic Phycomycetes, and supplemented by a key to the orders, the inoperculate and operculate Chytridiales, the Blastocladales, Monoblepharidales, Plasmodiophorales [*ibid.*, xxii, p. 40], Saprolegniales (Ectrogellaceae and Thraustochytriaceae), Leptomitales, Lagenidiales, and Peronosporales are described in detail and critically discussed. Each species is provided with the original citation, when known, and sometimes with excellent figures. Lists of substrata and synonyms and a 44-page bibliography are appended. This monumental work may be expected to become standard for many years and forms a valuable addition to the literature of the group.

WEI (C. T.) & HWANG (H. S.). **A checklist of fungi deposited in the mycological herbarium of the University of Nanking, I, (1924-1937).**—*Nanking J.*, ix, 1-2, pp. 329-372, [? 1942].

Rusts and powdery mildews comprise the majority of the 149 specimens of fungi collected in China from 1924 to 1937 and deposited in the mycological herbarium of the University of Nanking.

BESSEY (E. A.). **Notes on Hawaiian fungi.**—*Pap. Mich. Acad. Sci.*, xxviii (1942), Part I, pp. 3-8, 1943.

In these notes the author briefly reviews and discusses the relative prevalence of the different fungi reported from Hawaii.

LOWE (J. L.). **The Polyporaceae of New York State (except Poria).**—*Bull. N.Y. St. Coll. For.* 60, 128 pp., 2 pl., 1942.

Included in this critically annotated list of 141 Polyporaceae (exclusive of *Poria*) occurring within the State of New York or close to its borders is a new combination, *Polyporus lowei* (Pilát) comb. nov. (*P. trabeus*) on spruce. The manual is furnished with keys to the genera and species and a glossary.

RICK (J.). **O género Polystictus no Rio Grande do Sul.** [The genus *Polystictus* in Rio Grande do Sul.]—*An. Reun. sul-amer. Bot.*, 1938, ii, pp. 251–270, 1940. [Received May, 1943.]

This is a critically annotated list of 55 pedunculate species and 20 varieties of *Polystictus* collected by the author in the State of Rio Grande do Sul, Brazil.

RICK (J.). **Poliporos riograndenses.** [Polypores of the Rio Grande.]—*An. Reun. sul-amer. Bot.*, 1938, ii, pp. 271–307, 1940. [Received May, 1943.]

Technical descriptions, supplemented by other points of interest, are given of over 130 species and nearly 40 varieties of Polyporaceae collected by the writer in the State of Rio Grande do Sul, Brazil [*R.A.M.*, xvii, p. 629].

TORREND (C.). **As Poliporaceas da Bahia e Estados limitrofes.** [The Polyporaceae of Bahia and the bordering States.]—*An. Reun. sul-amer. Bot.*, 1938, ii, pp. 325–341, 1940. [French summary. Received May, 1943.]

This is a list, amplified by brief critical observations, of about 200 Polyporaceae collected by the author in Bahia and other regions of northern Brazil.

WYND (F. L.). **Respiration of mosaic-infected Tobacco plants.**—*Plant Physiol.*, xviii, 1, pp. 90–98, 1 graph, 1943.

Studies on the respiratory rates of healthy and mosaic-affected tobacco leaves [cf. *R.A.M.*, xxi, p. 307] showed that the rate of oxygen use by leaves from diseased plants was greatly increased by the fourth day following the inoculation of a lower leaf. This period of increased oxygen use preceded the general appearance of the virus in infectious concentration by about ten days. While the disturbed metabolism shown by the enhanced rate of oxygen use occurred in all parts of the plant simultaneously, the appearance of infectious concentration of new virus material occurred first in the upper leaves, which had a higher initial rate of metabolism. When infectious concentrations of virus appeared in the upper leaves, the rates of oxygen use by these leaves were always less than those of normal leaves. It is considered probable that the metabolic changes observed are cellular, and independent of any metabolic activity of the virus material.

VALLEAU (W. D.) & JOHNSON (E. M.). **An outbreak of Plantago virus in Burley Tobacco.**—*Phytopathology*, xxxiii, 3, pp. 210–219, 2 figs., 1943.

An outbreak of a necrotic virus disease in Burley tobacco near Lexington, Kentucky, in 1941 was found to be caused by the presence in the Ky. 36–12 Burley variety of the rib-grass (*Plantago major*) strain of the tobacco mosaic virus [*R.A.M.*, xxii, p. 44], the symptoms associated with which included marked stunting, long, depressed, dark streaks on the stalks, discoloured, sometimes concentrically patterned areas in the pith, and yellow, later necrotic, blotches on the leaves. Inoculations from the affected plants to Ky. 16 Burley and Turkish resulted in the development of mottling rather than typical necrosis. Both types of infection were observed in spontaneously diseased plants and are considered to be due to the same virus, the divergent reactions to which in different varieties are dictated by the presence or absence of the N¹ factor from *Nicotiana glutinosa*. None of the 14 strains of the tobacco mosaic virus from tobacco became systemically established in the *P. major* plants to which they were transferred.

Both June Pink and Marglobe tomatoes proved to be resistant to the rib-grass strain, their response to which was comparable to that of Ambalema Burley hybrids to the tobacco mosaic virus [ibid., xx, p. 499 *et passim*], but systemic infection developed in heavily inoculated, young, vigorous plants.

Field observations suggest that the existence of the rib-grass virus may have antedated the development of cultivated tobacco, in which case the numerous strains of the tobacco mosaic virus now recognized were presumably derived by mutation from the infective principle of *P. major*.

ESAU (KATHERINE). **Inclusions in guard cells of Tobacco affected with mosaic.**—*Hilgardia*, xiii, 8, pp. 428-430, 2 pl., 1941.

In the present study inclusions characteristic of tobacco mosaic, namely amoeboid, vacuolated X-bodies and striated material, were found to occur in the guard cells of stomata of tobacco plants. It was also demonstrated that the guard cells and the adjacent epidermal cells are connected with each other by plasmodesmata, but it remains an open question for the present whether plasmodesmata are necessary for the entry of the virus into guard cells.

ESAU (KATHERINE). **Phloem anatomy of Tobacco affected with curly top and mosaic.**—*Hilgardia*, xiii, 8, pp. 437-470, 18 pl., 6 figs., 1 diag., 1941.

The degenerative changes induced in the phloem of tobacco plants by the virus of curly top were found to be similar to those encountered in sugar beet [*R.A.M.*, xvi, p. 294]. In the apices of shoots and roots degeneration sets in as soon as the first sieve-tubes differentiate, appearing first in cells nearest to the sieve-tubes and sometimes, in root tips, in the differentiating sieve-cells themselves. This is rapidly followed by hyperplastic divisions leading to the formation of numerous short sieve-tubes. The difference between the hyperplastic and the normal tissues as regards cell pattern and the proportion of sieve-tubes is more striking in the primary than in the secondary phloem, although in the latter many ray cells differentiate into sieve-tubes and the phloem mother cells divide excessively.

The hyperplastic tissue disintegrates, particularly in the primary phloem, usually leaving cavities behind, although in less severe infections the collapsed hyperplastic tissue is replaced by new cells derived from the adjacent living cells. In tobacco plants recovering from curly top phloem degeneration is commonly present, even in organs showing no external symptoms, but is comparatively mild and of unequal severity in different parts of the same organ. The increased production of sieve-tubes almost invariably occurs even when the disease is most mild. The external symptoms of curly top appear on leaves most closely connected with the inoculated leaf by vascular tissue, thus confirming the conclusion that the virus is largely localized in the phloem.

In experiments with tomato plants the same degenerative changes were observed as in the tobacco and the sugar beet, the increased production of sieve-tubes being particularly striking. Owing to the larger size of their phloem cells the tobacco and the tomato are, it is suggested, more suitable for the study of hyperplastic sieve-tubes than is the sugar beet. The hyperplastic sieve-tubes are not essentially dissimilar from normal ones but usually lack companion cells.

The phloem of tobacco plants inoculated with the mosaic virus contained inclusion bodies typical of this disease, but no other abnormality.

SILBERSCHMIDT (K.) & CAMPOS (A. R.). **Novos aspétos do problema da formação dos cristais em folhas de Fumo atacadas pelo mosaico.** [New aspects of the problem of crystal formation in the leaves of mosaic-infected Tobacco.] —*Arq. Inst. biol., S. Paulo*, xii, 4, pp. 59-74, 5 pl., 1941. [German summary.]

In further studies on the crystalline inclusions in the cells of mosaic-diseased

tobacco leaves [*R.A.M.*, xviii, p. 633], the writers devised a method for the continuous examination of the same cells of a living leaf without interrupting its connexion with the plant. The technique consists essentially in the protection of the hair cells in the selected marginal area by a glass chamber constructed of three circular cover slips joined together by cement. As soon as this is in place, a general drawing is made, under a low magnification, of the zone under observation, each hair being individually numbered to facilitate its subsequent location. The cells are then examined at daily intervals under a high power and all changes in their contents carefully recorded.

The first crystals appeared in the hair cells of young Geudertheimer tobacco leaves on the eighth day following inoculation by rubbing with juice from diseased plants, while in somewhat older ones a longer period (15 days) was required for the development of the inclusions, which were not formed at all in the oldest foliage. In leaves detached from the plant and placed with their petioles in a nutrient solution, under which conditions they remained alive for several weeks, the crystalline inclusions were first detected after six days.

COLQUHOUN (T. T.). Spray trial to control spotted wilt of Tomatoes.—*J. Aust. Inst. agric. Sci.*, viii, 4, pp. 171–172, 1942.

In an experiment carried out in South Australia on the control of tomato spotted wilt by spraying with tartar emetic [*R.A.M.*, xxi, p. 115], plants of the South Australian Dwarf Red variety were sprayed (a) in the seed-bed only, (b) after planting out in the field only, and (c) both in the seed-bed and the field with a mixture of 1 gm. tartar emetic and 2 gm. white sugar per 1 l. water. The seedlings were raised in plots in an unheated greenhouse, and half were sprayed every second day from the time the cotyledons expanded. Six weeks after sowing the seedlings were placed outdoors for nine days; they were set out in the field on 9th October, 1941. Field spraying was started a day later, and was continued twice weekly until 6th March, 1942.

The plants sprayed in the field and in the seedling stage showed 31·7 per cent. spotted wilt, those only in the field 29·2 per cent., and those only in the seedling stage 49·2 per cent., while the unsprayed controls showed 59·2 per cent. spotted wilt. Taking all the sprayed plots together, there were 38·8 per cent. diseased fruits, while in the unsprayed there were 55·3 per cent., and in other unsprayed plots of similar size, outside the experiment, 71·1 per cent., the corresponding figures for weights of diseased fruits per cent. of total weights of crops being 35·7, 48·6, and 68·3 per cent. These figures show a highly significant difference between the three series of plots both in number and weight of infected fruit. They also indicate that the effect of the spraying exerted some beneficial influence on the contiguous unsprayed plots. As, however, the sprayed plots had about 30 per cent. disease, it may be questioned whether the treatment did in fact give control.

GOTTLIEB (D.). The presence of a toxin in Tomato wilt.—*Phytopathology*, xxxiii, 2, pp. 126–135, 2 figs., 2 diags., 1 graph, 1943.

Using centrifuge tubes adapted from those described by Hamm *et al.* for the spectrographic analysis of stem tracheal fluids (*Proc. Soc. exp. Biol.*, N.Y., xli, pp. 347–351, 1941), the writer collected the vascular fluids of Bonny Best tomato plants inoculated with *Fusarium bulbigenum* var. *lycopersici* and found that they contained a toxin [*R.A.M.*, xv, p. 406 *et passim*] capable of inducing wilt in seedlings placed in the extracts. No toxins were present in plants affected by physiological wilting due to an insufficiency of soil moisture.

WELLMAN (F. L.). **Increase of pathogenicity in Tomato-wilt *Fusarium*.**—*Phytopathology*, xxxiii, 3, pp. 175–193, 2 figs., 1943.

The great majority of the saltants in agar cultures of the tomato wilt fungus (*Fusarium bulbigenum* var. *lycopersici*) [*R.A.M.*, xxi, p. 393] exhibited a lower order of virulence than the parents, the occasional variations in the reverse direction of pathogenicity representing less than one sector in a thousand.

The thermal death point of conidia from a virulent isolate of the organism was about 60° C., compared with just above 50° for a mild. In 2- to 2½-year-old cultures conidial germination was more abundant from virulent than from mild isolates. Cultures from surviving conidia from old cultures of mild strains of the wilt pathogen were usually more toxic to the host than those from conidia that had not been allowed to age. On agar surfaces the mildly pathogenic form of *F. bulbigenum* var. *lycopersici* outgrew the virulent, but in mixtures of the two types in Tochinal's liquid medium, the reverse was commonly the case.

Susceptible Bonny Best tomatoes inoculated with a mild strain of the pathogen were ordinarily invaded only up to the cotyledonary node, but when isolates of both types were used as inoculum, the mild one proceeded parallel with the virulent into the upper parts of the plant, though the subsequent development of the latter was more extensive than that of the former. In the resistant Marglobe only the basal parts of the plants were involved to any appreciable degree, even in the case of mixed infections. Where progression towards the plant apex did occur, the virulent strain tended to predominate over the mild. The changes in virulence under discussion are concluded to partake of the nature of adaptive variation rather than genuine mutation.

GREEN (D. E.) & ASHWORTH (D[OROTHY]). **Blight of outdoor Tomatoes—spraying tests, 1942.**—*J. R. hort. Soc.*, lxviii, 6, pp. 179–183, 1943.

Particulars are given of preliminary spraying experiments to determine the relative value of seven fungicides for the control of outdoor tomato blight (*Phytophthora infestans*) at the Royal Horticultural Society's Garden, Wisley, Surrey, in 1942, when up to five applications were given between 20th July and 16th September. The best results were given by two copper-containing proprietary mixtures, designated C and D, followed by Bordeaux and Burgundy mixtures (4–6–40 and 4–5–40, respectively), plus saponin, and proprietary spray B, A being less effective and lime-sulphur (1 in 60) useless for the object in view. Burgundy mixture caused very slight foliar scorch and formed a bluish deposit on the fruits, the latter blemish being more conspicuous following treatment with Bordeaux, while lime-sulphur was responsible for severe injury in the form of white spots and blotches. One correctly timed treatment (first half of August) would appear to suffice for the control of the disease in south-eastern England.

SKOK (J.). **Defoliation of Tomato plant as a response to gaseous emanations from the fruit.**—*Bot. Gaz.*, civ, 3, pp. 486–489, 1943.

In the eastern and mid-western tomato-growing areas of the United States defoliation of tomato plants during the latter part of the season is a major problem. As a rule it becomes noticeable as the fruits begin to ripen, and it progresses rapidly as larger amounts of fruit are produced. The process generally starts with shedding of the leaves nearest the crown in close proximity to the fruits that have ripened earliest. It proceeds progressively towards the terminal ends of the branches as subsequent clusters of fruit ripen. Finally, only the leaves at the tips of the branches are left.

Fields almost denuded of green leaves frequently become green again owing to new shoot growth in the axils of the leaf scars on the old vines. By such time most of the fruits have decayed or withered, and new growth, weather permitting,

appears to be possible as soon as they have been removed. Vines which fail to produce new shoots have ripe fruits on or near them. Plants in home gardens where the fruits are removed as soon as ripe, show less defoliation than those in commercial fields, where large numbers of over-ripe fruits are allowed to accumulate.

Experiments were made to test the view that the defoliation was associated with gaseous emanations from ripe fruits. Young potted tomato plants placed in glass chambers with ripe tomato fruits showed very severe epinasty after 18 hours. After two days a number of the lower leaves abscised, on the fourth day only the top leaves remained (and these showed conspicuous epinasty), and on the sixth day most of the plants were dead. Controls in similar chambers without ripe fruits were unaffected.

Late in August young potted tomato plants were transplanted at random in a field of tomatoes which were in full bearing and showed marked defoliation. The young plants were planted near the old ones, in such a manner that ripe fruits were immediately beneath them. After four days the young plants had become pale, and some of their leaves and leaflets were curled. On the fifth day the lower leaves were yellow and curled and the tips of several leaflets had become dry. A day or two later all the lower leaves died, while the upper ones were curled and had dried tips and edges. Some of the older leaves had abscised, but in most cases the blades were dry, and the petioles remained attached, abscising later. After 15 or 16 days the remaining upper leaves regained colour and resumed growth; the fruits underneath these plants had by this time dried up. During the entire period control plants placed about 20 ft. away from the edge of the field remained normal.

In a third experiment ripe tomato fruits were placed under several plants (of two varieties) which had not previously become defoliated and from which the fruits had been regularly harvested shortly after turning red. Extreme defoliation resulted, though control plants under which ripe fruits were not placed remained unaffected. Various nutrition experiments failed to demonstrate any relation between the condition and nutrition. The evidence suggests that the defoliation in question is probably due to gaseous emanations from ripe fruits present on the vines. Ethylene, it is considered, may be one of the principal compounds involved.

MULLISON (W. R.). Certain aspects of the nutrition of Tomato seedlings in sand culture.—*Proc. Ind. Acad. Sci.*, li, pp. 94–99, 2 diags., 1 graph, 1942.

In sand culture studies on the nutrition of Marglobe tomato seedlings severe stunting resulted from heavy applications of phosphates when nitrates were absent or extremely deficient. Shortage of phosphorus was also characterized by stunting, accompanied by a purplish tinge originating along the veins on the under sides of the leaves. Slight stunting and chlorotic mottling of the foliage were signs of sulphur deficiency. Plants lacking a sufficiency of potassium showed marked dwarfing and a downward curling of the leaves, while the absence of calcium led to severe stunting and the death of the terminal meristem. Sodium was shown to be capable of greatly retarding or modifying the appearance of potassium-deficiency symptoms, while the presence of the former in addition to the latter element afforded a definite stimulus to the growth of the plants.

ROTH (E. R.) & HEPTING (G. H.). Origin and development of Oak stump sprouts as affecting their likelihood to decay.—*J. For.*, xli, 1, pp. 27–36, 1 fig., 1 graph, 1943.

The investigations fully described and tabulated in this five-year progress report on the origin and development of oak stump sprouts in relation to their susceptibility to decay [*R.A.M.*, xix, p. 245 and next abstracts] were carried out on two one-acre areas in western Virginia, in which the 55-year-old stands were cut in 1935 and 1936, leaving stumps about 12 in. high and 10 in. in diameter in one

stand and 7 in. in the other. Sprouts of basal origin were found to be least likely to contract infection, but only 30 per cent. of the dominant sprouts fell into this group; it is therefore advisable to eliminate at an early stage the highest sprout, which tends to become dominant and may produce a rotten crop tree, and to encourage the new growth formed on the lower part of the trunk. These measures will be most effective if taken when the stands are under 20 years old, preferably from 8 to 15.

An estimate of future butt rot in the study plots, based on the heights of origin of the dominant sprouts, indicates that some 32 per cent. of the trees alive at 40 years will be affected.

ROTH (E. R.) & HEPTING (G. H.). **Wounds and decay caused by removing large companion sprouts of Oaks.**—*J. For.*, xli, 3, pp. 190–195, 2 figs., 1943.

In 68 oaks of mixed species from which companion sprouts larger than 3 in. at the base had been cut 6 to 12 years earlier in the course of thinning operations, butt rot (*Stereum gausapatum*) [see preceding and next abstracts] had entered nine through the remaining stub or wound and a further five showed infections that had probably originated in this way. In 1935–6, companion sprouts were removed from 127 trees by (a) cutting flush with the remaining stem, (b) cutting off at 3 ft., and (c) girdling. At the end of five years 27 per cent. of the wounds from 1 to 2.5 in. wide and 5 per cent. of those measuring 2.6 to 4 in. were closed, while none of the larger ones had completely healed over. Most wounds were larger at the end of a year than when originally made on account of bark die-back, and those measuring 5.6 in. or more in width generally took four years to revert to their former size. About half the girdled trees and 3 ft. high stubs had died back to the crotch, where callus formation was in progress. Of the 19 per cent. of the wound surfaces harbouring decay fungi, only two bore heart-rotting organisms, one *S. gausapatum* and the other *Ustulina vulgaris*.

ROTH (E. R.). **Effect of invisible decay on deterioration of untreated Oak ties and posts.**—*J. For.*, xli, 2, pp. 117–121, 1943.

Hypholoma sublateralitum, *Stereum gausapatum* [see preceding abstract], an unidentified species of *Poria* emitting a smell of cabbage in culture, and *Polyporus* [*Polystictus*] *versicolor* were the fungi most commonly isolated at the end of five to six years from oak logs infected but showing no perceptible signs of decay when placed in position, one lot being partially buried in cinders and the other set in the ground to simulate railway sleepers and posts, respectively. It is estimated that such material would decay about a year earlier than that from sound trees. Little or no benefit was derived from eight months' seasoning of the logs.

HERRICK (J. A.) & ALEXOPOULOS (C. J.). **A further note on the nitrogen metabolism of *Stereum gausapatum*.**—*Ohio J. Sci.*, xlii, 3, pp. 109–112, 1942.

As already reported, synthetic media containing inorganic salts or asparagin as the sole source of nitrogen support little or no growth of *Stereum gausapatum* [*R.A.M.*, xix, p. 125], whereas a 1 per cent. peptone-containing substratum yielded abundant mycelium. The addition to media in which peptone, asparagin, or ammonium ions represented the only sources of nitrogen of minute amounts of thiamin (10^{-4} gm. per 50 c.c.) greatly increased growth, but the growth substance did not exert the same effect on substrata containing only nitrate ions. The fungus is therefore capable of utilizing asparagin and ammonium salts, as well as peptone, as sources of nitrogen, the thiamin content acting as the limiting factor.

PADY (S. M.). **Further notes on the witches' brooms and the substomatal pycnia of *Melampsorella*.**—*Proc. Kans. Acad. Sci.*, xliv, pp. 190–201, 13 figs., 1941.

Descriptions are given, accompanied by photographs, of witches' brooms

produced by *Melampsorella* on *Picea engelmanni* and *Abies lasiocarpa* in the Gothic region of Colorado. During the winter the brooms are dormant, but in June the leaves appear and almost immediately pycnidia are formed. Infected leaves are paler than normal. The aecidia develop slowly during July and August, maturing on *Picea* during the latter month and on *Abies* by the end of the former. The warm, dry summer of 1940 induced early maturity of the aecidia and death of many infested branches. On *P. engelmanni* the aecidia impart an orange-red colour to the brooms, forming a striking contrast to the dark green of the normal foliage. The excrescences are frequently situated at or near the top of the tree, some very close to the trunk and others at the end of a long branch. One of the largest brooms observed on this host measured over 6 by 2 to 3 ft. On *A. lasiocarpa* the roughly circular brooms are pale green and very compact, one of the best specimens being about 12 in. in diameter.

Exsiccata from the Arthur Herbarium of *Melampsorella* spp. on its aecidial hosts showed that on *Picea* spp. the pycnidia are all substomatal, while on *Abies* spp. they are subcuticular. The diameter of the mature pycnidia of the rust on *P.* spp. ranged from 86 to 140 μ , and the height had the same range, while the species on *A.* spp. measured 100 to 230 μ in diameter and 23 to 40 μ in height, with an average of 141 by 35 μ . The results are considered to indicate that two species of *Melampsorella* are involved, and not one, as Arthur thought.

LUTZ (L.). **Sur l'attaque du bois par les Hyménomycètes lignicoles. Cas du *Daedalea quercina*.** [On the infection of wood by lignicolous Hymenomycetes. The case of *Daedalea quercina*.]—*Boissiera*, vii, pp. 293–295, 1943.

During the period between 28th March, 1939, and 28th July, 1942, a sample of beech wood exposed to contact with a culture of *Daedalea quercina* from oak under controlled conditions of excessive humidity underwent conversion into a translucent mass. As in the case of *Coriulus* [*Polystictus*] *versicolor* on the same substratum [*R.A.M.*, x, p. 700], the process of disorganization was initiated by hydrolysis of the lignin component, followed by disintegration of the cellulose and ultimately of the middle lamella.

SENGUPTA (S. K.). **Spore-germination of *Ganoderma lucidum* (Leyss.) Karst.**—*Curr. Sci.*, xii, 2, pp. 59–60, 1943.

Spores of *Ganoderma lucidum* obtained from sporophores collected at Calcutta from September to November, 1942, germinated readily on a medium consisting of 2 per cent. malt extract, 2.5 per cent. agar, and 100 c.c. distilled water, P_H 6.8, at a temperature range of 20° to 32° C. and a relative humidity of 52 to 98 per cent. Under laboratory conditions the sporophores discharged spores for one to two days. Field observations over a number of years indicate that the spore fall in *G. lucidum* is usually profuse while the hymenial surface is moist and grey, lessening when the colour pales to white, and ceasing on the development of a brownish tinge. Writing personally from Singapore to S. R. Bose, who was successful in germinating the spores of the fungus in 1929 (*Bot. Gaz.*, lxxxvii, pp. 665–667), E. J. H. Corner states that the spores are ejected only from well-grown sporophores, with tubes 1 cm. or more in length, but in the author's specimens the tubes did not measure more than 2 to 3 mm.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes.** xiv.—*Pap. Mich. Acad. Sci.*, xxviii (1942), Part I, pp. 215–233, 6 pl., 1943.

In this further instalment of his critically annotated list of resupinate Polypores from the Great Lakes region of the United States [*R.A.M.*, xxi, p. 397] the author states that *Poria mutans* Peck is commonly distributed throughout the range of chestnut, frequently fruiting on the ends of old logs and in hollow butts. It is

associated with a pocket rot, and when fruiting bodies are found, the decay is often so far advanced that the logs attacked consist of concentric layers of reddish-brown, rotted wood, loosely held together. The type of decay associated with this fungus resembles that caused by *Polyporus croceus* [ibid., xi, p. 680]. The tubes of *P. mutans* are up to 6.5 mm. long, mostly about 4 mm., as compared with 5 to 20 mm. for *P. croceus*, which is also usually plicate.

Poria vulgaris has been confused in herbaria with *P. vaporaria*, partly because a number of different fungi are found under these names. The spores of the two species are similar, but in *P. vaporaria* the mouths of the tubes are mostly 1 to 2 per mm., while in *P. vulgaris* they are generally 4 to 5 per mm. Further, the mouths of *P. vaporaria* do not glisten. *P. vulgaris* is one of the commonest members of the resupinate polypores in Sweden, and occurs much more abundantly in northern Europe than in America. In Sweden it is usually found on old fences, but in the United States it rarely attacks structural timbers. Many different growth forms of *P. vulgaris* are stated to have received 'herbarium' names at European institutions.

Many field records erroneously attribute rot caused by *Trametes odorata* to *Lenzites sepiaria*, the result being that the fungus is in reality more prevalent than it appears to be from published accounts. Fungi generally found on conifers occasionally occur on hardwoods and there is an authentic record of *T. odorata* on an oak railway sleeper. Many of the wood-destroying fungi found on hardwoods can be cultured on coniferous wood, and vice versa.

Plant diseases and insect pests. Notes by the Biological Branch.—*J. Dep. Agric. Vict.*, xli, 1, pp. 29–33, 5 figs., 1943.

Ring spot (*Mycosphaerella brassicicola*) of crucifers is widely prevalent in southern Victoria; it has greatly reduced the market value of cabbages during wet seasons in some of the heavier soils round Melbourne. It seldom causes any great loss of yield, but it detracts from the appearance of cabbages and cauliflowers. Most of the cabbage, cauliflower, and Brussels sprouts seed crops inspected during the past season were found to be infected, some severely, with a resultant reduction in seed yield. Growers should resort to hot-water seed treatment (30 minutes at 122° F. followed by 5 to 10 minutes in cold water).

Commercial growers and home gardeners who use their own pea seed are advised to examine their crops carefully for *Ascochyta* blight [*A. pisi*, *A. pinodella*, and *M. pinodes*: *R.A.M.*, xxi, p. 438] and *Septoria* leaf blotch (*S. pisi*), of which the former is the more serious.

Weather conditions were very favourable during the past season to the development of onion mildew (*Peronospora destructor*), which occurred in epidemic proportions in many parts of Victoria. Infection was particularly severe in metropolitan market gardens, where onions are planted too thickly. Onions should not be cultivated in low-lying areas sheltered by hedges or wind-breaks; ample spacing should be provided, infected refuse should be burnt, and rotation should be practised.

JOLIVETTE (J. P.) & WALKER (J. C.). Effect of boron deficiency on the histology of garden Beet and Cabbage.—*J. agric. Res.*, lxvi, 4, pp. 167–182, 10 pl., 1943.

A microscopic study of the histological changes occurring in garden beet [*R.A.M.*, xxii, p. 235] and cabbage [ibid., xx, p. 554] plants grown under conditions of boron deficiency in nutrient sand cultures in the greenhouse or in the field, was conducted in Wisconsin. In beet, it was found that the first signs of disease in the roots and hypocotyl of seedlings appear in the phloem cells (many of which are entirely or partly filled with a dense substance) and in occasional hypertrophy of cambial cells. In older beet plants primary and secondary xylem

cells were found to contain a brown deposit and occasionally to become distorted. Groups of disintegrated cells were frequently seen surrounded by proliferating ones, sometimes involving one or two bundles and thus giving rise to macroscopic necrotic areas. In roots subjected to acute boron deficiency at a somewhat later stage the most severe necrosis occurred in the tertiary ring or rings most active in differentiation at the time. In the leaves of young beet plants the most extensive degeneration was found in the vascular bundles of the petiole. Such abnormal development was seen commonly in old leaves which appeared normal outwardly, and in which it had occurred too late to influence gross morphology. The extent of histological changes in younger leaves was directly proportional to the severity of external symptoms. In petioles of unilaterally developed leaves the bundles on one side showed slight if any changes, while those on the other side were severely degenerated. Cell enlargement and proliferation extending to the mesophyll and spongy parenchyma was seen in the leaf lamina. Cell proliferation also occurred in the cambium and the pith of the floral axis. Necrotic areas were found in the pith and in the vascular region of secondary and tertiary rings, being sometimes connected with similar regions in the cortex, where the lesions occasionally involved epidermal cells.

In cabbage extensive proliferation of cells in the region of the cambium of root, hypocotyl, and stem of young plants resulted in a band of meristematic tissue several times the normal width of the undifferentiated zone between phloem and xylem. Accordingly, there was less differentiation, and subsequent necrotic development in the vessels and phloem elements. Occasional abnormalities were observed in the cortex of the stem apex, but necrosis in the pith was rare until the plant entered the heading stage. In the field boron deficiency symptoms were usually confined to this region. In the petiole and lamina the chief sign of disease was a disturbed differentiation of the vascular bundles.

In both beet and cabbage boron deficiency seems thus to affect chiefly the metabolic processes involved in cell division, differentiation, and possibly storage. The cells react at first by discoloration of the walls and contents, excessive division, and abnormal enlargement; later necrotic areas appear, consisting of disintegrated cells, which are frequently surrounded by a region of abnormally active hyperplastic, hypertrophied, and sometimes peculiarly differentiated cells. The pathological histology of black spot of garden beet and internal breakdown in the pith of cabbage was found to be the same in plants cultured in nutrient sand or grown in the field. In both beet and cabbage extensive histological changes were observed before the appearance of macroscopic symptoms.

YARWOOD (C. E.). Onion downy mildew.—*Hilgardia*, xiv, 11, pp. 595–691, 13 figs., 1943.

Onion mildew (*Peronospora destructor*) is stated to have a world-wide distribution. In California, where the present study was started in 1935, it is considered to be the most serious disease of the onion seed crop, causing losses up to 70 per cent. of the total crop and up to 100 per cent. in individual fields. Infection of the leaves appears to have little effect, but that of the seed stalks leads to reductions in yields of seed. The disease, previously recorded on onion, *Allium fistulosum*, *A. nigrum*, leek, *A. ursinum*, *A. oleraceum*, garlic, shallot (*A. ascalonicum*), and *A. schoenoprasum*, was observed by the author only on the first two species. All varieties of the common onion were found to be susceptible, though varying considerably in the amount of injury sustained. In systemic infections paling, down-curling, and narrowing of the leaves is typical; and in secondary infections from sporangia produced by primary infections, the large, oval, slightly chlorotic lesions on leaves and seed stalks are present; while the most characteristic symptom

is the greyish-violet, downy growth of sporangiophores covering infected leaf tissues.

The author uses the name *P. destructor*, with Berkeley as the sole authority [and not (Berk.) Caspary apud Berkeley], for the causal fungus of downy mildew, not accepting Wilson's (*Mycologia*, vi, pp. 192-210, 1914) and Cook's [*R.A.M.*, xii, p. 484] reasons for including Caspary as a second authority.

In culture the sporangia of the fungus failed to make continued growth on agar media to which various test nutrients were added. The most stimulatory of these test nutrients was potassium permanganate. On plates of agar, the germ-tube of the fungus grew at about 30μ per hour.

Other fungi accompanying downy mildew on onions and causing serious losses, though all less important than *P. destructor*, were *Botrytis allii*, *Macrosporium* sp., and *B. cinerea*. Infection with *Macrosporium* was more frequent on the north than on the south side of onion seedstalks. In California mildew infection is believed to be carried over from one season to another chiefly by means of mycelium in the bulbs. Seed from heavily infected plants produced healthy plants in two tests. Sporulation of the fungus normally took place at night, the sporangia maturing in the early morning and being liberated throughout the day. The optimum relative humidity for sporulation was about 100 per cent., the minimum about 90 per cent.; the optimum temperature about 13°C ., the minimum between 4° and 7° , and the maximum between 22° and 25° . At a low relative humidity sporangiophores were shorter than at a high humidity. It appeared from a series of tests that exposure of infected plants to light favoured subsequent sporulation in darkness, that during sporulation light was unfavourable to the process, and that the normal diurnal cycle of sporulation of the fungus in nature is in part an adaptation to the alternation of light and darkness in the normal day. Sporangia were found to be disseminated by the wind. They remained viable for about three days when attached to sporangiophores on living leaves, but for only about one day when detached and lying on the surface of healthy leaves. The germination of sporangia required the presence of free water, the germ-tube entering the host plant through the stomata. Germ-tubes were observed to penetrate beyond the area of inhibition by drying or eradicant sprays in about seven hours, and the mycelium grew at a rate of about 300μ per hour in the leaf. In one test the infected tissues sporulated already five days after inoculation, but usually this interval was longer. Artificial infection was achieved by six different methods. Systemic infection of plants grown from bulbs was induced by injecting a spore suspension into the bulbs prior to planting. The epidemiological factors considered as critical under Californian conditions are, in order of importance: source of inoculum, temperature, moisture conditions, and wind. The disease may be severe in the absence of rain. Sporangia of the fungus germinated better on plain agar than in water, causing infection at temperatures from 1° to 28° , with an optimum at about 13° . Sporangiophores were formed at from 7° to 22° . The mycelium was killed by heating infected bulbs for four hours at 41° and by heating infected leaves for ten hours at 37° .

In spore-germination tests, peptone and asparagin were antagonistic to Bordeaux mixture; sulphur dust was toxic to sporangia on agar plates and on rubbed onion leaves, but not on glass slides or on normal onion foliage. Sulphur sprays inhibited sporulation more effectively than did copper sprays. Rosin lime-sulphur or malachite green sprays did not appear to kill the mycelium in the tissues but reduced the injury from infection. The addition of vegetable oils to various copper sprays increased their protective value. In field tests, under conditions of severe disease, all fungicidal sprays tested reduced the incidence of infection and increased yields by 60 to 5,700 per cent., possibly the best results being achieved with the rosin lime-sulphur mixture. Marked control was obtained with

applications of concentrated sprays in the form of vapour dusts, but dry-dust fungicides proved useless.

McNEW (G. L.) & SAYRE (C. B.). **The use of fungicides during war time. II. Effect of soil fertility on returns from use of fungicides.**—*Canner*, xevi, 7, pp. 14–15, 42–44, 3 figs., 1 graph, 1943.

In April, 1942, Surprise pea seed both untreated and treated with spergon at the rate of 2 oz. per bush. was sown in unfertilized plots and plots receiving 600 lb. of 5–20–5 fertilizer per acre. In each of two tests the treated seed gave about 90 per cent. stand, while the untreated gave 76 per cent. in the first and 82 to 85 per cent. in the second. Soil fertility had no effect on seed decay, but it affected yield. In both tests, the smallest yield was given by untreated seed in unfertilized soil, and the largest from treated seed in fertilized soil. On the average, the two treatments nearly doubled the yield (raising it from 1,877 to 3,524 lb. per acre). Either treatment, used alone, increased yield by 700 to 1,100 lb. per acre, but the full value of each was realized only when both were used together. The same relationship was established by a test with Wisconsin Early Sweet peas in 1941.

John Baer tomato plants in plots each receiving one of nine fertilizer treatments were sprayed with copper oxychloride sulphate (4 lb. per 100 gals.), using nearly 200 gals. per acre in each of four applications between 20th July and 21st August; a similar series of plots was dusted four times with the same compound mixed with talc, so as to give 6 per cent. metallic copper, and a third series remained undusted and unsprayed. On 31st August, all the sprayed and dusted plots were given an application of Bordeaux mixture (4–2–50). A severe attack of *Macrosporium* [*Alternaria*] *solani* developed in August, and by 1st September the unsprayed plants had become heavily defoliated. The spray and dust both retarded infection very satisfactorily, but the dust was less effective than the spray.

Spraying and dusting generally increased the yield on the better fertilized plots by about 6 tons per acre, and by 3 tons on the poorer ones. The average increase from spraying in all nine fertilizer treatments was 5.36 tons and from dusting 4.6 tons. The yields show precisely the same relative results as the two pea tests. The poorest yield came from the unfertilized, unsprayed plot, and the heaviest from the sprayed plot given 3–12–12 special fertilizer. The combined effect of the two treatments was to increase yield from 7.6 to 24.3 tons per acre. The unsprayed, unfertilized plot gave a gross receipt of only \$128 per acre, spraying increasing the value (partly through the improved grading that resulted) of a similar plot by about \$88; the unsprayed, fertilized (3–12–12 special) plot realized \$264 per acre, and spraying increased the value by nearly \$200 per acre. These data demonstrate conclusively that only a mere fraction of the value of the fertilizer was realized when the plants were severely diseased, and that spraying was much more profitable on well-fertilized plants than on unfertilized ones.

McNEW (G. L.). **The use of fungicides during the war. III. Value of different seed treatments for Lima Beans.**—*Canner*, xcvi, 8, pp. 14–17, 3 figs., 1943.

Lima beans [*Phaseolus lunatus*] of the Henderson Bush variety sown on 30th May, 1942, when conditions favoured seed decay, after treatment with yellow cuprocide (1 oz. per bush.), thiosan (1.5 oz.), spergon (3 oz.), no treatment, no treatment but seed inoculated with a humus culture of nodule bacteria, fermate (2 oz.), spergon (1.5 oz.), spergon (inoculated seed, 1.5 oz.), semesan jr. (1.5 oz.), and semesan jr. (inoculated seed, 1.5 oz.) showed, respectively, 29.8, 47.8, 53.6, 27.2, 26, 50.4, 49.4, 52.2, 35, and 38.8 per cent. emergence. The same relative results were obtained in tests carried out on 20th May and 4th and 11th June. The benefits from the best treatment (spergon 3 oz.) varied with severity of seed

decay; increase in emergence in the earliest experiment over the controls was ten-fold, in the second double, in the third 50 per cent., while in the last sowing (11th June) the untreated seed gave an equally good stand. The treatments also increased the yields in about the same ratio as they improved emergence. Spergon (3 oz.) increased the yield over the whole series of experiments by 33 per cent., and at $1\frac{1}{2}$ oz. by 32 per cent.; fermate and thiosan gave increases of 29 and 26 per cent., respectively. The only material that failed to produce an increase was yellow cuprocide, which is toxic to Lima beans because it hardens the seed coat. In field tests under commercial conditions, generally confirmatory results were obtained.

It is concluded that the general treatment of Lima bean seed with spergon at about 2 oz. per bush. will prove profitable. Thiosan (1 or 1.5 oz.) and fermate (2.5 oz.) may be given limited tests by canners interested in seed treatment. An ounce of graphite should be added if the seed is sown by drills.

PARBERRY (N. H.). The excessive uptake of manganese by Beans showing scald and magnesium deficiency. Its regulation by liming.—*Agric. Gaz. N.S.W.*, liv, 1, pp. 14–17, 1 fig., 1943.

In further studies [cf. *R.A.M.*, xxi, p. 62] on 'scald' of dwarf French beans [*Phaseolus vulgaris* var. *nana*] in New South Wales, three soils, A, B (sandy loams), and C (a heavy loam), liable to produce affected crops were treated by the addition of slaked lime 3 tons, dolomite 4 tons, and sulphur 600 lb. per acre. After mixing, the soil was transferred to earthenware pots on 9th October, 1941, and wetted to field capacity. On 23rd March, 1942, the soil was given a complete fertilizer, seed from locally grown beans was sown, and the pots were placed out of doors.

On 30th May, the plants in soil A, untreated, were largely defoliated following scald, in lime- and dolomite-treated soil A they showed a normal green foliage, and in sulphur-treated they were defoliated. The yields of green pods per pot were, respectively, 21, 81, 67, and 5 gm. In soil B, similar results were obtained but in soil C, untreated, lime-treated, and dolomite-treated the foliage was normal, while in the sulphur treatment it was partially defoliated, following slight scald. The manganese content of beans in the untreated soils was high (A, 207, B, 262, C, 780 p.p.m.) but intensification of acidity by sulphur caused a greatly increased intake of this element (A, 530, B, 291, C, 1,340 p.p.m.). As in the field, plants with magnesium deficiency symptoms contained the most manganese. Lime and dolomite very effectively regulated manganese uptake (soil A, lime 38, dolomite 45 p.p.m., B, 36 and 32, C, 68 and 66 p.p.m.). Reduction of acidity had a much smaller effect on the uptake of iron, and this uptake was considerably greater in the pots than in the field, showing the mobility of iron even at reactions near neutrality.

The excessive uptake of manganese, iron, and, possibly, aluminium by bean plants liable to scald, as well as chlorosis due to magnesium deficiency, are varied expressions of mineral depletion of soils, giving rise to excessive acidity. In the former case, acidity has caused the mobilization of manganese and iron in excess of the amounts required for good growth, while the continuous loss of magnesium has been partly responsible for the slow increase in soil acidity. The use of dolomite against soil acidity is preferable where crops show magnesium deficiency. It provides lime and magnesium, and reduces acidity as effectively as the more active forms of lime, when used in chemically equivalent amounts, 3 lb. slaked lime approximating to 4 lb. dolomite.

MOUNCE (IRENE) & BOSHER (J. E.). Seedling blight of Carrot caused by *Alternaria radicina*.—*Sci. Agric.*, xxiii, 7, pp. 421–423, 1 fig., 1943.

In recent greenhouse tests of carrot seed in British Columbia most of the

seedling blight that occurred was due to *Alternaria radicina* [*R.A.M.*, xxi, p. 360], apparently not before reported as causing seedling blight in North America. During the last two years, 28 samples of carrot seed were grown in the greenhouse in steam-sterilized soil; in 1940, the 14 samples of seed produced were either uninfected or gave only a negligible amount of seedling blight, while in 1941, of 14 samples produced, only five were uninfected or almost so, six showed 14 to 18 per cent. seedling blight due to this fungus, one showed 22 per cent., one 27 per cent., and one 40 per cent. Weather conditions during the harvesting of the seed in 1941 had been highly unfavourable.

When cultures from infected seedlings were used as inoculum, typical black rot was produced in surface-sterilized carrot roots and typical seedling blight in healthy young seedlings.

Almost complete control was given by seed treatment with semesan jr. (1 per cent. ethyl mercury phosphate), new improved ceresan diluted to contain 1 per cent. ethyl mercury phosphate, or spergon (tetrachloroparabenzquinone).

KREUTZER (W. A.) & GLICK (D. P.). The role of packing methods in the increase of anthracnose of Honeydew Melon plants.—*Phytopathology*, xxxiii, 3, pp. 245–248, 1943.

This is an expanded and tabulated account of the writers' tests at the Colorado Agricultural Experiment Station to determine the relation of handling methods to the incidence of anthracnose (*Colletotrichum lagenarium*) in Honeydew melons, a note on which has already been published from another source [*R.A.M.*, xxi, p. 512]. It is stated in the present paper that as few as four diseased fruits, gently rinsed in 4 l. water, provided a source of inoculum for the healthy melons washed in the same tank. The spores of the fungus were inactivated by five minutes' immersion in a solution containing chlorine at a strength of 120 p.p.m., but even at a concentration of 1,000 p.p.m. the chemical failed to destroy all the conidia embedded in active lesions on the melons. No injury to the host was caused by treatment with 10,000 p.p.m. chlorine for five minutes.

COOK (H. T.) & HARTER (L. L.). Chemicals effective for Sweet Potato seed treatment.—*Bull. Va. Truck Exp. Sta.* 109, pp. 1801–1807, 1942.

A tabulated account is given of laboratory and seed-bed tests to determine the relative efficacy of various chemicals in the control of sweet potato black rot (*Ceratostomella fimbriata*), the results of which showed that ten minutes immersion of the 'seed' in 2 per cent. boric acid, five or ten minutes in 2.5 per cent. borax, and ten minutes in 0.1 per cent. mercuric chloride plus 3 per cent. wettable sulphur eliminated infection without impairing sprout production. At the present juncture, mercuric chloride is both difficult to obtain and very costly, and its replacement by borax or boric acid (preferably the former) is therefore indicated. Mercuric chloride alone and 1.6 per cent. semesan bel (one-minute dip) also effectively combated *C. fimbriata*, but significantly reduced the yield of sprouts.

BOND (T. E. T.). Pod spot of Okra (*Hibiscus esculentus* L.) and a leaf spot of *Hibiscus rosa-sinensis* L. in Ceylon.—*Trop. Agriculture, Trin.*, xx, 4, pp. 67–70, 4 figs., 1943.

In 1941, *Hibiscus rosa-sinensis* in the author's garden at St. Coombs, Talawakelle, Ceylon, became affected by a leaf spot, attributed at the time to an unidentified species of *Phyllosticta*. A year later, *H. esculentus*, in the same garden, was attacked by a destructive pod disease associated with *Ascochyta abelmoschi* [*R.A.M.*, xviii, p. 413]. Further examination of the fungus previously thought to be a *Phyllosticta* showed that it was, in fact, an *Ascochyta*, and that it might be *A. abelmoschi*.

The fungus associated with the okra pod spot showed immersed, erumpent, dark brown pycnidia with a dark, thickened rim round the ostiole. Measurements of 50 pycnidia showed that the diameter measured 60 to 130 (mean 102.5 ± 2.25) μ , while the ostiole diameter was 10 to 30 (19.2 ± 0.61) μ . The ripe pycnidia extruded spore tendrils immediately on immersion in water, which measured 3 to 4 mm. by 20 to 30 μ . The hyaline, oval to oblong or very slightly curved spores were rounded at the ends, sometimes guttulate, mostly continuous, but with a small percentage of bicellular spores, sometimes slightly constricted at the septum. A mixed population of 100 spores measured in water showed the dimensions to be 4.5 to 9.5 (6.5 ± 0.14) by 2 to 4 (2.8 ± 0.05) μ . A random selection of ten spores of each type gave the following mean measurements: unicellular 5.9 by 2.7 μ , bicellular 7.6 by 3.1 μ . The fungus grew readily with copious aerial mycelium on maltose agar plates and on steamed potato cylinders, but formed no pycnidia in one month.

In the case of the disease of red *Hibiscus* the pycnidia resembled those described above, except that they were more regularly circular. Measurements from a sample of 25 seen *in situ* in 1941, showed the diameter to be 105 to 200 (153.6 ± 5.66) μ and the ostiole 15 to 40 (29.6 ± 1.08) μ in diameter, while in 1942 the corresponding figures were 80 to 155 (122.4 ± 0.07) and 20 to 30 (22.8 ± 0.58) μ . The spores were quite similar in shape and appearance to those of *A. abelmoschi*, but varied greatly in size from year to year. Spore measurements (from samples of 50) gave, in 1941 (no bicellular spores) 4.5 to 7.5 by 2 to 3 (5.9 ± 0.09 by 2.4 ± 0.04) μ , in 1942 (with bicellular spores) 6 to 9 by 2 to 4.5 (7 ± 0.11 by 2.8 ± 0.06) μ , and at a second examination in 1942, 5.5 to 10.5 by 2.5 to 4 (8.4 ± 0.14 by 3 ± 0.05) μ , the average for the 150 spores being 7.1 by 2.7 μ .

As *A. abelmoschi* has not previously been recorded on any host but *H. esculentus* a comparison is made between the leaf spot disease observed by the author and what has been recorded on *Hibiscus* spp., a complete list of the fungi known to occur on the genus being presented. There is no outstanding analogy between any of them and the leaf-spot fungus, which is, accordingly, identified provisionally with *A. abelmoschi*.

HADORN (C.). **Vergleich der Wirksamkeit verschiedener Spritzbrühen gegen den falschen Rebenmehltau.** [Comparison of the efficacy of various sprays against Vine downy mildew].—*Schweiz. Z. Obst- u. Weinb.* lii, 3, pp. 54–69, 1 fig., 4 graphs, 1943.

Further tests at the Wädenswil (Zürich) Research Station on Riesling $\times$ Sylvaner hybrids of preparations designed to control vine downy mildew (*Peronospora*) [*Plasmopara viticola*] with economy in copper consumption [*R.A.M.*, xxii, 287] are fully described and tabulated. The principal conclusions may be summarized as follows. The allegation that lime-sulphur helps to save copper must be repudiated. The efficiency of a Bordeaux-lime-sulphur mixture is in inverse proportion to the concentration of the latter compound. The admixture of lime-sulphur with Bordeaux impairs both the physical and chemical properties of the latter spray, the suspensory capacity of which rapidly declines after 1 to 1½ hours, and a precipitate of copper sulphide is formed which renders the mixture altogether useless for mildew control. The stimulus to growth reputed to result from the addition of lime-sulphur to Bordeaux mixture was not observed in the trials under discussion.

Copper cannot be replaced by zinc, aluminium, or magnesium sulphates or other metallic salts, e.g., silver, cadmium, chrome, mercury, and iron, and for the present it is therefore essential to use existing stocks with the utmost economy consistent with adequate disease control. The large-scale treatment of vines with either copper or sulphur dusts is considered to be inadmissible during the economic crisis involving the shortage of both elements.

REED (G. M.). **Report on research for 1942. Plant pathology.**—*Rep. Brooklyn bot. Gdn.*, 1942 (*Brooklyn bot. Gdn. Rec.*, xxxii, 2), pp. 75–78, 1943.

In this report [cf. *R.A.M.*, xxi, p. 446] the author states that 45 selections of Lee $\times$ Victoria and 8 selections of Hairy Culbertson $\times$ Victoria oats were found to be susceptible (like the parents) to the new race of loose smut [*Ustilago avenae*: loc. cit.], whereas 15 selections of Victoria $\times$ Richland (including all those selected for other qualities than resistance) were resistant to the new race and to all other races tested. Two selections of Nortex $\times$ Victoria were resistant. Of 38 selections of Victoria $\times$ Fulgrain, 11 were resistant and 27 susceptible.

The second generation plants of hybrids involving Victoria and Monarch were inoculated with race 1 of covered smut [*U. kolleri*: loc. cit.], to which Victoria is resistant and Monarch susceptible. The data obtained indicate a single genetic factor for resistance. When the second generation plants of a hybrid between Markton and Navarro (both highly resistant varieties) were tested, 86 plants inoculated with race 1 of loose smut and 84 inoculated with race 1 of covered smut remained unaffected. The second generation plants of a third hybrid between Markton and Red Rustproof were inoculated with the Red Rustproof race, and of 136 plants grown 13 (or 9.5 per cent.) became infected. The third generation of these hybrids is expected to throw light on the factors for resistance involved.

Nine distinct races of loose smut and 13 of covered smut were differentiated by L. G. Utter on nine oat varieties from 1938 to 1941. The 1942 data indicate that five of the remaining collections of covered smut could be separated from the other races by the use of four further oat varieties as differential hosts. Three more collections of loose smut were differentiated by the use of three oat varieties. The differential varieties used were susceptible to race 1 of loose and race 1 of covered smut. Some gave high infections with the new races while others remained unaffected.

Bacterial soft rot [cause unspecified] appeared in the new bearded iris beds in mid-May, and reached epidemic proportions in July and August. Experiments by L. G. Utter indicated that the causal organisms were able to enter by the foliage, rhizomes, and roots. In most cases it was necessary to break the surface of these organs in a manner resembling insect injury to accomplish rotting.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, liv, 3, pp. 116–120, 8 figs.; 4, pp. 155–158, 5 figs., 1943.

Brief, popular notes are given on the following pea diseases occurring in New South Wales: *Mycosphaerella* blight (*M. [pinodes]*), bacterial stem blight [*Pseudomonas pisi*], powdery mildew [*Erysiphe polygoni*], downy mildew [*Peronospora pisi*], root rots [*Fusarium solani* var. *martii* f. 2 and other fungi], *Fusarium* wilt (*F. [orthoceras* var. *pisi*]), spotted wilt, and mosaic. Spotted wilt (caused by the tomato spotted wilt virus) sometimes occasions appreciable losses. The symptoms appear as necrotic, purplish- to bluish-brown streaks on the stems, sometimes extending along their entire length. One-sided development of affected plants is often noted, and spotting and vein necrosis occur on the young leaves and pods. Mosaic is somewhat widespread, but causes only slight loss. The leaves of the more mature plants show light and dark areas characteristic of mosaic diseases. Tall vine varieties are said to be more seriously affected than canning types.

The Department of Agriculture has built up stocks of disease-free seed, and it is hoped that pea seed reasonably free from disease will be available to growers in the near future. Long crop rotations are recommended, though shorter ones of three to five years may in some cases be sufficient. All pea seed should be dusted before sowing with copper oxychloride (2 oz. per bush.) or an organic mercury dust, such as agrosan, ceresan, or zetan (1 oz. per bush.). Treated seed in 1942 trials gave 76 to 99 per cent. germination against 23 to 76 for the untreated.

Showery weather during the autumn of 1942 in the Murrumbidgee Irrigation

Area favoured the development of citrus *Septoria* spot (*S. [? citricola: R.A.M., xx, p. 341]*). Bordeaux mixture (5-5-100 and $2\frac{1}{2}$ - $2\frac{1}{2}$ -100) and copper oxychloride were applied in trials begun in late March, white oil ($\frac{1}{2}$ gal. per 100 gals.) being added in each instance. With navel oranges all the sprays gave almost complete control, though the unsprayed trees had up to 50 per cent. severely infected fruits. With Valencia oranges, Bordeaux mixture at the higher concentration gave nearly 100 per cent. clean fruits, but the half-strength mixture and the copper oxychloride gave a small percentage of infection. Growers who suffer loss each year should spray annually in February-March, before the autumn rains. If spraying is effected every year and the losses are not severe, the weaker Bordeaux mixture or the copper oxychloride should suffice. If fumigation against insects is necessary, it should be carried out several days before spraying.

Plant diseases and insect pests. Notes by the Biological Branch.—*J. Dep. Agric. Vict., xli, 4, pp. 213-217, 6 figs., 1943.*

These notes contain the following items of interest. Root rot of onions, caused by *Fusarium oxysporum* [*R.A.M., xviii, p. 7*] was responsible for considerable losses (from one to three tons per acre) in the Colac district, Victoria, and also in the metropolitan area. The disease is stated to make hand-sorting of the crop essential, thus greatly increasing the cost of production. Owing to the destruction of the roots, the diseased plants are easily pulled up and the tops may turn yellow prematurely. On harvesting, the extent of damage may not be easily noticed, but upon closer examination, a soft rot of the basal plate and the lower portions of the bulb scales can be detected, and in many cases whitish fungal hyphae are visible. In storage the rot extends upwards eventually destroying all the contents and leaving only the dry shell.

Blight (*Bacterium [Xanthomonas] juglandis* [*ibid., xviii, p. 91*]) is stated to be the predominant disease of walnut in Victoria. If attacked by the organism at an early stage of development of the tree, the kernel usually rots or the fruit may drop prematurely; at a later stage, black, sunken areas appear, which spread slowly and may finally cover almost the entire fruit. On the leaves, small, black, necrotic spots develop, and if this type of attack is severe, the general health of the tree is affected. In order to reduce the carry-over of infection, all diseased fallen fruit and leaves should be burnt, but, in general, the disease is difficult to control. Notes on spraying as practised in America are added.

MARTIN (J. P.). Pathology.—*Rep. Hawaii Sug. Exp. Sta., 1941-2 (ex Printed Reps. Hawaii Sug. Pl. Ass., 1942), pp. 23-36, 1943.*

In this report [*cf. R.A.M., xxi, p. 349*] it is stated that during the period under review tomatoes in Hawaii were severely affected by spotted wilt, little control of which resulted from weekly and bi-weekly applications of tartar emetic [*ibid., xxii, p. 330*]. Considerable damage was caused to young and mature tomatoes and egg-plants in several localities by *Bacterium solanacearum*. Carrot late blight (*Macrosporium carotae*) [*ibid., xx, pp. 2, 560*] at Kailua was in one instance very serious, causing the death of the tops. This appears to be the first record of the disease in Hawaii. In several areas, broccoli was attacked by *Erwinia carotovora*, causing a slimy, wet rot confined to the soft tissues within the main stem; side shoots were occasionally affected. Affected plants should be removed and destroyed. When broccoli plants are harvested, the stem should be cut obliquely, because if a horizontal cut is made a slight depression is formed on drying, which collects moisture and induces conditions favouring the pathogen. Knives which have been used to cut diseased plants should be sterilized. Infection takes place mainly through wounds. The same organism also caused a decay of bulb onions. The diseased tissues were water-soaked, and afterwards turned soft and mushy. The pathogen

does not appear to penetrate sound tissues or scales, but enters through the neck and spreads downwards. Affected onions should be sorted and promptly marketed, or be dried and stored under dry conditions.

Studies of the Chytrid associated with sugar-cane chlorotic streak [ibid., xx, p. 276] were continued by C. H. Carpenter; this is the only invading organism so far observed in association with this disease with sufficient constancy for it to be regarded as a cause of the symptoms. The apparent recovery or masking of the symptoms observed in Queensland has been attributed to the high internal temperature of the stalks when exposed to the sun, and in this connexion it is pointed out that the causal agent becomes inactivated at a relatively low temperature, for in Hawaiian experiments some 90 per cent. healthy shoots developed from diseased cuttings after treatment in water at 45° C. for 20 minutes [cf. ibid., xii, p. 722]. A. F. Bell has reported an internal stalk temperature of 44.5° in recumbent cane in the field, and this may explain why the disease persists to a marked degree only in the wetter areas, where sunlight is less and rather lower temperatures prevail than is the case in the drier parts.

The first ratoons of two chlorotic streak experiments with 31-2806 begun in July 1938, were harvested in July, 1942. Statistical analysis of the yields showed a definitely beneficial effect on cane and sugar yields from the hot-water treatment of affected cuttings and from the use of healthy as compared with diseased cuttings. In the plant crop there was very little chlorotic streak in the plots planted with healthy cuttings or diseased, treated ones, but in the ratoon crop the condition was moderate to severe in all plots. In the second experiment, all plots were planted with selected healthy, hot water-treated cuttings of 31-2806. In the plant crop all plots remained comparatively free from disease, but in the ratoon crop all plots were moderately affected.

In a test of comparative resistance to chlorotic streak, 28-1813, 28-4291, 29-3859, 31-624, and 34-2635 showed no symptoms, while 31-2484, 34-2095, U.D.50, Yellow Caledonia, P.O.J.36, and D.1135 were only slightly affected.

The seriousness of eye spot [*Helminthosporium sacchari*: ibid., xxi, p. 349] has greatly diminished with the rapidly increased use of resistant varieties, notably 32-8560, while 32-1063 and 32-3575 have also assisted in control.

Leaf scald [*Xanthomonas albilineans*: loc. cit.] has not, so far, been found on 32-1063 or 32-8560. Planted in areas where infection has been severe, these varieties have given very high sugar yields.

The very low incidence of sugar-cane mosaic in Hawaii is due to the selection of healthy planting material, improved control of weeds, and the roguing of affected canes in combination with the use of resistant varieties.

STARR (M.P.) & WEISS (J. E.). **Growth of phytopathogenic bacteria in a synthetic asparagin medium.**—*Phytopathology*, xxxiii, 4, pp. 314-318, 1943.

With the technical assistance of H. P. Klein and Charlotte B. Sisselman, the writers tested the capacity of 173 isolates of phytopathogenic bacteria, consisting of 66 different species and varieties, to grow through four consecutive transfers at 27° C. in a synthetic medium containing asparagin as the sole source of both carbon and nitrogen. Certain genera and groups comprising Bergey's superseded genus *Phytomonas* [R.A.M., xxi, p. 517] were found to exert a distinctive action on the substratum, a character that may serve as a valuable aid to the classification of the bacterial plant pathogens. All 60 isolates of *Pseudomonas* grew well on repeated transfer on the synthetic medium, whereas none of the 57 *Xanthomonas* isolates could do so. Among the organisms utilizing asparagin were *Agrobacterium* [*Bacterium*] *gypsophilae* (the genus *Agrobacterium* was recently established by Conn: *J. Bact.*, xlv, pp. 353-360, 1942 to include gall-forming phytopathogenic bacterial and related soil forms), *A. [Bact.] radiobacter*, *A. [Pseudomonas] savastanoi* and its

var. *frazini*, *A. [Bact.] tonellianum*, *A. [Bact.] tumefaciens*, *Corynebacterium fascians* (the only phytopathogenic species of this genus that grew on the asparagin medium), *Phytomonas [Xanthomonas] stewarti*, *Pseudomonas alliiicola*, *P. angulata*, *P. atrofaciens*, *P. caryophylli*, *P. cichorii*, *P. coronafaciens*, *P. delphinii*, *P. jaggeri*, *P. lacrymans*, *P. maculicola*, *P. medicaginis* var. *phaseolicola*, *P. mellea*, *P. pisi*, *P. polycolor*, *P. primulae*, *P. [Bact.] solanacearum*, *P. striafaciens*, *P. syringae*, *P. tabaci*, *P. tomato*, *P. viridiflava*, and *P. viridilivida*. *X. stewarti* differs from most species of *Xanthomonas* in its lack of flagella, failure to peptonize milk, or to produce hydrogen sulphide, and inability to attack cotton seed oil (as shown by the spirit blue agar technique) [*R.A.M.*, xxi, p. 517], and to these criteria are now added its ability to grow in a medium in which asparagin is the sole carbon and nitrogen source as contrasted with the inability of typical *X. spp.* to grow under identical conditions. For these reasons the authors suggest that the name *Phytomonas stewarti* be retained until the precise taxonomic position of that species is determined.

BREED (R. S.) & ST. JOHN-BROOKS (R.). **International Association of Microbiologists Nomenclature Committee. Appointment of Judicial Commission on Bacteriological Nomenclature.**—*Brit. J. exp. Path.*, xxiv, 2, pp. i and ii, 1943.

In accordance with the decision of the Third International Congress for Microbiology held at New York in September, 1939 [*R.A.M.*, xix, p. 554], a Judicial Commission on Bacteriological Nomenclature has been appointed, consisting of R. E. Buchanan, A. J. Kluyver, E. G. D. Murray, S. Orla Jensen, J. Howard Brown, A. R. Prévot, J. Ramsbottom, Th. Thjötta, A. Lwoff, E. Renaux, A. Sordelli, and C. Stapp. This arrangement has been made in the hope that some plan for taking tentative action on questions of nomenclature can be developed by those members of the Commission who can be reached under war conditions.

In a note by Dr. R. St. John-Brooks, Lister Institute, Elstree, Hertfordshire, it is stated that any questions respecting the interpretation of rules or recommendations in nomenclature may be submitted in the prescribed manner to the Chairman, Professor R. E. Buchanan, but bacteriologists in Great Britain and the British Empire may find it convenient to apply to him in the first instance.

It is hoped that the Judicial Commission will consider, *inter alia*, the proposed Bacteriological Code of Nomenclature.

DOWSON (W. J.). **On the generic names *Pseudomonas*, *Xanthomonas* and *Bacterium* for certain bacterial plant pathogens.**—*Trans. Brit. mycol. Soc.*, xxvi, 1-2, pp. 4-14, 1943.

The author is in favour of discarding the genus *Erwinia*, which was founded on one character only, its pathogenicity to plants; the few chemical activities recorded in its definition may equally apply to other genera. Such segregation of plant pathogens from the similar colon-typhoid group of bacteria is not considered justifiable. It is argued generally that the time is not ripe yet for the erection of a large number of bacterial genera, and that in classifying the colon-like bacteria, one generic name, *Bacterium*, should be adopted for the whole group. As the type species, *Bact. trilobulare*, is not recognizable, it is suggested that a new type species should be designated. Accordingly, it is recommended that (1) the generic names *Erwinia*, *Escherichia*, *Eberthella*, *Salmonella*, and others of Bergey's Enterobacteriaceae such as *Shigella*, *Klebsiella*, and *Aerobacter* be discarded, (2) *Bacterium* Ehrenberg, 1828 be designated a *nomen conservandum*, (3) the type species of *Bacterium* be designated as *B. coli* Escherich, 1885, and (4) the genus *Bacterium* be so defined as to include not only those species universally regarded as constituting the colon-typhoid-dysentery group but also the peritrichous plant pathogens.

A list is given of the Gram-negative bacterial plant pathogens to be included in the three genera *Pseudomonas*, *Xanthomonas*, and *Bacterium*. Among those

included in the first group the following new combinations are of interest: *P. betae*, *P. bowlesii*, *P. calendulae*, *P. cumini*, *P. eriobotryae*, *P. gardeniae*, *P. panacis*, *P. primulae*, *P. punctulans* for *Phytomonas betae*, *P. bowlesii*, *Bact. calendulae*, *P. cumini*, *Bact. eriobotryae*, *P. gardeniae*, *Bact. panaxi*, *P. primulae*, [*Bact. punctulans*], respectively, and also *Pseudomonas medicaginis* var. *phaseolicola* and *P. savastanoi* var. *fraxini* for which two organisms the author proposes the names *P. phaseolicola* and *P. fraxini*, respectively. In the second group are, among other species, the following new combinations: *X. albilineans*, *X. alfalfae*, *X. antirrhini*, *X. celebensis*, *X. corylina*, *X. dieffenbachiae*, *X. holcicola*, *X. gummisudans*, *X. itoana*, *X. lactucae*, *X. nakatae*, *X. nigromaculans*, *X. oryzae*, *X. phormicola*, *X. rubrilineans*, *X. tardicrescens*, and *X. vitians* for *Bact. albilineans*, *Phytomonas alfalfae*, *Pseudomonas antirrhini*, *P. celebensis*, *Phytomonas corylina*, *Bact. dieffenbachiae*, *Bact. holcicola*, *Bact. gummisudans*, *Pseudomonas itoana*, *Bact. lactucae*, *Bact. nakatae*, *Bact. nigromaculans*, *Pseudomonas oryzae*, *Bact. phormicola*, *Phytomonas rubrilineans*, *P. tardicrescens*, and *Bact. vitians*, respectively. Finally, the third group comprises the following 15 organisms: *Bact. amylovorum*, *Bact. ananas*, *Bact. aroidae*, *Bact. carotovorum*, *Bact. cassavae*, *Bact. citrimaculans*, *Bact. mangiferae*, *Bact. marginatum*, *Bact. phytophthorum*, *Bact. pseudotsugae*, *Bact. rhaponticum*, *Bact. rhizogenes*, *Bact. salicis*, *Bact. tracheiphilum*, and *Bact. tumefaciens*.

RIKER (A. J.). **Bacteria pathogenic on plants.**—*Publ. Amer. Ass. Adv. Sci.* 12, pp. 46–56, ? 1940. [Received June, 1943.]

The author suggests that many of the broad fundamental questions in biology, equally interesting to human, animal, and plant bacteriologists, can be approached through genetic studies of phytopathogenic bacteria with a facility worthy of special consideration. The bacteria pathogenic to plants produce a wide range of symptoms on many different kinds of hosts and show a considerable range of variability, while the technical advantages of working with plants are manifold.

RIKER (A. J.). **The relation of some chemical and physico-chemical factors to the initiation of pathological plant growth.**—Reprinted from *Growth, Fourth Growth Symposium*, vi, pp. 105–117, 3 figs., 1942.

Among the important factors bearing on the problem of pathological plant growth (as illustrated by *Phytomonas* [*Bacterium*] *tumefaciens* galls and comparable non-parasitic growths), the following are discussed: loss in pathogenicity of the cell-stimulating bacteria induced by amino acids; their recovery of pathogenicity in certain media and after ultra-violet treatment; oxygen hunger of the plant cells; changes in osmotic pressure, which may induce swelling of plant cells; the presence of exceptional amounts of enzymes and of growth substances such as thiamin, riboflavin, pantothenic acid, and biotin; bacterial metabolites, e.g., ammonia, phosphatides, phospholipides, and polysaccharides, which irritate plant cells; and the presence of abnormal amounts of food materials. When some of these and other important factors are present in unusual combinations and proportions, living cells generally begin to enlarge and multiply. The initiation of pathological growth may perhaps be associated with an unbalanced combination of such factors.

POUND (F. J.). **The quest for witches' broom resistant trees.**—*Proc. agric. Soc. Trin. Tob.*, xliii, 1, pp. 55–63, 1943.

In this interesting survey of the author's journeys to the Amazon Valley, he relates that he returned in 1942 to obtain budded progeny or rooted cuttings of cacao trees marked by him as free from witches' broom disease [*Marasmius perniciosus*: *R.A.M.*, xxii, p. 163] in 1938 and since reported to have remained unaffected. Of the trees tagged in the peninsula between the Navay and the Amazon, to the east of Iquitos [Peru], all were still healthy save one, which showed one

point of infection. This region (which is in a heavily infected area) was surveyed in detail, with the result that a group of 27 trees was found, about half of which were very slightly infected, while the remainder were quite healthy. It was then ascertained that these trees had been planted many years before from the seeds of a single cacao pod from the Rio Napo.

In all, 32 trees were selected, all of them entirely free from infection, some being known to have been unaffected since 1938. Most were growing in well shaded situations, but others grew better with much less shade, and it seemed apparent that trees with a certain degree of resistance develop very little infection when growing in full sunlight. If this proves to be the case, and the immortal trees [*Erythrina velutina* and *E. umbrosa*] can be removed, cacao cultivation in Trinidad will be facilitated.

The beans produced on the Amazon are large and plump, but no pale ones were seen. All were uniformly purple, but in many cases the pods, with their warty surface and long point, looked as if they contained genes of criollo types. Samples of cacao from the introduced trees are to be prepared, but the chief task at present is to propagate and test the new strains.

BROWN (E.) & ROBERT (ALICE L.). *Alternaria* sp. on grain kernels killed by high temperature storage.—*Phytopathology*, xxxiii, 4, pp. 333–335, 1 fig., 1943.

A species of *Alternaria* of the *tenuis* group was found to be present on seed-grain of oats from Idaho, wheat from Nebraska, and barley from Virginia stored from six to 15 months at 36° and 50° F., whereas at 105° the fungus was absent. In a germination test made in 1940 on wheat samples to confirm these observations, the mould was found in abundance, after a week's incubation at 68°, on seed from a lot stored for seven months at 50°, while the grain that had been kept for the same period at 105° was quite sound.

FITZGIBBON (M.). Seed disinfection. The determination of the adhesiveness of seed dressings to cereal seeds.—*J. Soc. chem. Ind., Lond.*, lxii, 1, pp. 8–11, 1 fig., 1 diag., 1943.

The degree of control of cereal diseases by the treatment of the seed-grain with organo-mercurial dry dressings being largely dependent on the facility with which the powder is distributed over, and remains adhering to, the seed, a procedure was devised at Lunevale Products, Ltd., Queen's Mill, Manchester, enabling the adhesiveness of such products to be determined in relation to any given seed. Carefully selected lots of seed (30 gm. of peas and wheat and 25 of oats and barley) were dressed with a known weight of fungicide or filler material, and after the treated samples had been allowed to fall through a glass tube 23 by 1 in., with a 2½ in. diameter glass funnel at the top, from a moderate height (70 cm.) directly on to an 80 I.M.M. sieve, they were weighed to ascertain the amount of dressing still retained [cf. *R.A.M.*, xxi, p. 131]. The miniature seed dresser was of the churn type, a 4 oz. wide-mouthed bottle serving as a receptacle for the grain. Blank tests showed a loss in weight of wheat of 0.0016 gm. each drop and other rates more or less constant, for other seeds. Allowance for this loss is made in estimating retention.

Of the four proprietary British fungicides, designated D to G, E and G were noteworthy for their adhesion to Maple peas (0.2 per cent.) and Onward oats (0.3 per cent.), respectively. The latter preparation comprised an unusually large number of needle-shaped crystals, the penetration of which between the seed coat and seed may have accounted for its satisfactory performance, while the former contained a percentage of a partly saponified mixture of fatty acids to assist the adhesion of the particles to the relatively large and smooth-coated pea seeds. Tables are given showing the loss sustained by dressed seed in the various tests. For instance, wheat treated with D showed after 1, 2, 3, 4, and 5 drops 0.0355, 0.0285, 0.0246, 0.0215, and 0.0184 gm. retained, respectively, the mean results from two repeat trials

being 0.0351, 0.0282, 0.0244, 0.0213, and 0.0183 gm. respectively. Examination of the three Canadian dusts showed marked differences in their ability to adhere to different cereals. The addition of 0.5 per cent. oil to the talc filler improved adhesion.

It is concluded from these observations that manufacturers' specifications should aim at achieving a retention on the seed of 50 per cent. of the dressing used. The degree of subdivision should be within an upper limit of $30\ \mu$ diameter with an average particle size of $10\ \mu$ for very approximately spheroidal particles. A definite crystalline form further appears desirable.

HENRY (A. W.). **On the value of spergon for seed treatment in small-grain crops.**—

Phytopathology, xxxiii, 4, pp. 332–333, 1943.

Wheat and oats seed-grain and flax seed were treated with cerasan, spergon, and formaldehyde at various localities in Alberta, the two cereals being inoculated with their respective covered smuts [*Tilletia caries* and *T. foetida* in the case of wheat and *Ustilago kollerii* in that of oats], and also carrying a small quantity of natural inoculum, while the flax was clean. Spergon was applied at the rate of 2 oz. per bush. a week before sowing, cerasan at $\frac{1}{2}$ oz., and formaldehyde at 1 in 320. Spergon reduced the incidence of wheat bunt in four localities from between 15 and 42.5 to between 0 and 1 per cent., cerasan to between 0.2 and 2.2, while formaldehyde gave absolute control. The corresponding percentages for oats smut in three localities were from 10.8 to 17.7 to between 1.2 to 11.5, 0.0 to 0.2, and 0.0 to 0.5, respectively.

Cerasan raised the emergence of flax at Edmonton from 53 to 81.5 per cent. and the yield from 8.4 to 9.3 bush. per acre, the corresponding figures at Castor being from 59.8 to 71.1 per cent. and from 5.5 to 6.6 bush., respectively. The emergence of spergon-treated plants at Edmonton and Castor was 75.3 and 65.1 per cent., respectively, and the yields 10.2 and 6.4 bush., respectively.

The use of spergon as a seed treatment is evidently to be recommended, especially for wheat and flax.

HART (HELEN). **Stem rust on *Triticum timopheevi*.**—*Phytopathology*, xxxiii, 4, pp. 335–337, 1 fig., 1943.

In 1942 *Triticum timopheevi*, which is normally highly resistant to nearly all races of stem rust (*Puccinia graminis tritici*), showed 35 per cent. infection on some of the experimental plots at University Farm, St. Paul, Minnesota, all parts of the plant being involved. The reaction was one of moderate susceptibility. Wheat varieties and hybrids in the plots were exposed to stem-rust inoculum early in the season, uredospore suspensions of races 15B, 17, 34, 36, 56, and 147 being applied with a hypodermic syringe on 26th May, to border rows between the plots and repeated at five- to seven-day intervals. By 3rd June, infection was already spreading from the intervening rows to the plants in the plots, which were not directly inoculated. *T. timopheevi* was attacked only by race 15B (apparently distinct from 15, which is mildly pathogenic to the same host in Canada [*R.A.M.*, xx, p. 54]). Seedlings of *T. timopheevi* inoculated with 15B gave a type 3+ response. Loegering and Stakman have already reported (*Phytopathology*, xxii, pp. 12–13, 1942) the virulent action of 15B on the new, hard, red spring wheat, Rival, which is immune from 15A, and drawn attention to the danger of its presence in the spring wheat area of the United States.

WHITE (N. H.). **The effect of biotin and thiamin on the growth of fungi isolated from lesioned roots of take-all affected Wheat.**—*J. Aust. Inst. agric. Sci.*, ix, 1, p. 36, 1943.

Examination of the lesioned roots of wheat plants affected with take-all showed that as the disease progressed *Ophiobolus graminis* became replaced by other fungi. Further work demonstrated that *O. graminis* was the only one among these

organisms that required biotin for growth, indicating that competition for this material in the root tissues was not a factor concerned. The growth of some of the fungi was increased when thiamin was supplied to them. To eliminate isolates suspected of being *O. graminis* in the course of cultural work, it is only necessary to inoculate a biotin-free synthetic solution with all isolates assumed to be *O. graminis*. The growth of any isolate would establish that it was not *O. graminis*.

DILLON WESTON (W. A. R.) & GARRETT (S. D.). **Rhizoctonia solani associated with a root rot of cereals in Norfolk.**—*Ann. appl. Biol.*, xxx, 1, p. 79, 1943.

In 1938, cereal crops (particularly barley, but also wheat and oats) in Norfolk were affected by a partial failure. Patches of backward, stunted plants were observed shortly after growth had started or had been resumed in spring. The diseased areas were generally small and well-defined, but occasionally they spread over $\frac{1}{4}$ acre or more. Some or all of the plants in these patches were generally dead or dying by the middle of June, while the survivors were greatly delayed in growth and still green.

The roots of the affected plants showed the presence of *Rhizoctonia* [*Corticium*] *solani*, the most conspicuous effect being the killing short of the first-formed crown roots, as in Australia [*R.A.M.*, xii, p. 159; xvii, p. 166]. The diagnosis was confirmed by isolation and by pathogenicity tests. The disease is at present only of minor importance, having been recorded from only seven farms in Norfolk. Further investigations are in progress.

MCKAY (R.). **On an epidemic of *Gibberella saubinetii* (Mont.) Sacc. on Wheat in Eire in 1942.**—*Sci. Proc. R. Dublin Soc.*, N. S., xxiii, 11, pp. 111–129, 2 pl., 1 map, 1943.

An epidemic outbreak of *Gibberella saubinetii* [*G. zeae*: *R.A.M.*, xxii, p. 165] on wheat is recorded in Eire in 1942. The name 'cereal scab' is proposed for this disease, which is known elsewhere as 'ear blight', 'wheat scab', '*Fusarium*-blight', or 'headblight'. A memorandum sent out by the Department of Agriculture established the presence of the disease in 10 counties on five different varieties of wheat, but as the investigation was started very late in the season, after much of the grain had been threshed, it is quite possible that the disease was present also in the remaining counties. The reduction in yield (at an estimated average normal yield of 1 ton of grain per statute acre) caused by the disease amounted to 21·8, 38·4, and 55 per cent., respectively, in the three counties chosen for comparison. Apart from this reduction in weight of grain, much of the harvested crop consisted of shrivelled grain of low germinability. Although the fungus may attack any part of the wheat plant, the greatest losses occur when the ears are affected. Infection of the ears may take place from the flowering period onwards throughout the time the grain is in the stooks, but it is most harmful in the period between flowering and the 'soft dough or setting' stage. The earliest symptoms consist in small brown or water-soaked spots on the outer glume, which may in time cover one entire spikelet or, under wet weather conditions, a whole group of spikelets. Occasionally the whole head becomes diseased, frequently the grains too are invaded, and many of the spikelets are either completely barren or contain a few shrivelled grains. The pink or reddish discoloration of diseased grains was very prominent in 1942, being most intense at the germ-end. Perithecial development occurred freely and was apparently influenced by moisture rather than temperature.

Perithecia were also found on panicles of oats (varieties Marvellous and Victory II) in County Galway, this being the first record of the fungus on oats under natural conditions in the British Isles.

The epidemic in 1942 was associated with abnormally rainy weather, starting early in July; the summer of that year had the least sun and was the wettest in Eire for 11 years. It is believed that the disease had been endemic in certain dis-

tricts of Eire for a considerable time. *G. zeae* was recorded for the first time in Eire in 1918 by Lafferty; since then, samples of diseased grain received by the Department of Agriculture in 1930 were found to harbour a species of *Fusarium*, which was probably the conidial stage of *G. zeae*, as the outward appearance and the toxic properties of the grain would seem to suggest. Furthermore, diseased specimens and reports received from counties on both the eastern and the western coasts indicated that the disease had been present there on several occasions since 1930. All observations on growing crops previous to 1942 refer only to a *Fusarium* stage, and may, therefore, have included several species, but it is assumed that *G. zeae* is likely to have been among them.

In a footnote it is stated that seedling blight due to *G. zeae* was reported from several counties after the present paper had gone into print. In practically every case, February sowings of the wheat variety Queen Wilhelmina were affected.

O'CONNELL (T.). **Storage and treatment of seed Wheat.**—*J. Dep. Agric. Éire*, xxxix, 2, pp. 224–229, 1942.

This broadcast talk deals with thin stands of wheat ascribed, particularly in late-sown crops, to the use of low germinating wheat. Since loss of germinability in wheat grain is most definitely associated with high moisture content [see next abstract], it is recommended that seed-grain be thoroughly dried prior to storage during winter. Seed-grain that has been stored in a cold loft or barn should not be sown before being tested for germination. This caution applies particularly to sowings made in late winter or spring, since wheat sown in autumn (October and November) very rarely produces thin stands.

LAFFERTY (H. A.). **On the moisture content of Wheat in relation to its bushel weight and keeping quality.**—*J. Dep. Agric. Éire*, xxxix, 2, pp. 230–244, 2 graphs, 1942.

The results of trials started in 1940 indicate that a high degree of moisture (exceeding 14·5 per cent.) is detrimental to the keeping quality of wheat seed-grain. When stored in closed jars, grain containing 18·5, 24·9, 19, and 25·7 per cent. moisture developed abundant growth of *Penicillium* and *Aspergillus*, while that with a high moisture content (30·4 and 30·7 per cent.), had a decidedly alcoholic smell and showed masses of yeast spores (*Saccharomyces* sp.), but no moulds. It is suggested that the absence of filamentous fungi from these samples may be due to the inhibiting effect of the alcohol produced by the yeasts. It is concluded that when the moisture content of mature wheat of good quality is reduced to 13 per cent. or under, it may be stored with safety in bags or other containers. The most satisfactory method of reducing the moisture content of seed wheat is by kiln-drying; where this is not possible, wheat grain stored loose in bulk should be turned and thus aired periodically, but only in dry weather. Where the crop has been properly harvested in the field the best and safest way to keep it over the winter is in the stack.

PHIPPS (I. F.), HOCKLEY (S. R.), & PUGSLEY (A. T.). **Warigo—a disease-resistant Wheat.**—*J. Aust. Inst. agric. Sci.*, ix, 1, pp. 17–20, 3 figs., 1943.

After stating that wheat stem rust (*Puccinia graminis*) is estimated to have caused a loss of £1,500,000 in South Australia during 1941, the authors report that the Nabawa × Hope crossbred, developed at the Waite Institute, and then in the F₁₀, showed resistance in all areas where infection was severe. At the conclusion of the season, this wheat (strain 37–76) was released to farmers under the name 'Warigo'. The mature plant shows high resistance to the predominating Australian race of stem rust (34), though the seedling stage is susceptible to it. Warigo is also highly resistant at maturity to Australian race 16 of leaf rust (*P. triticea*). To flag smut (*Urocystis tritici*) it is even more resistant than is Nabawa; in tests in

which Federation and Free Gallipoli wheat showed 70 to 80 per cent. infection, Nabawa usually had 1 to 3 per cent. disease, and Warigo always less than 1 per cent. As regards bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*], Warigo appears to have inherited a partial resistance from Hope. When tests were made with a collection of strongly pathogenic strains, Hope, Warigo, and Nabawa generally showed 0 to 5, 35 to 45, and 60 to 70 per cent. infection, respectively. More resistance than is shown by Warigo will be necessary before 'pickling' can be dispensed with. Inoculations made in 1940 with a single collection of loose smut (*Ustilago tritici*) gave 100 per cent. infection in Ranee, as against only 1 per cent. in Warigo. This result was confirmed in 1942. In the field, Warigo has always shown high resistance to the prevailing races of powdery mildew (*Erysiphe graminis*). Under certain glasshouse conditions, some infection may develop on it, and on Hope, though Thew and Sonora remain unaffected.

SAXBY (S. H.). **Eye-spot in Wheat.**—*N.Z. J. Agric.*, lxvi, 5, pp. 257–261, 4 figs., 1943.

An outbreak of eye spot of wheat (*Cercospora herpotrichoides*) [*R.A.M.*, xxi, p. 521] is reported for the first time for New Zealand from the Taieri district of Otago, and later the disease was also found in three other districts. It is estimated that approximately 300 acres are severely, and 600 acres or more moderately infected. Slight attacks did not seem to result in any apparent decrease in yield, but one severely infected area, which under normal conditions could be expected to yield 80 bush. per acre, yielded only 2 of very poor quality wheat, while less severely infected areas yielded 30. The chief variety of wheat grown in the Taieri district is stated to be Cross 7; there is, however, no evidence to show that it is more susceptible to eye spot than any other variety. The following control measures are recommended on the basis of the available knowledge of the disease: no wheat should be sown on land on which infected wheat grew during the previous year, or on which wheat or barley has been recently grown; all seed harvested from infected crops should be used for milling or feeding only; in order to reduce the danger of reinfection, all infected stubble should be burnt; and straw from infected crops should not be used for distribution.

TAPKE (V. F.). **Physiologic races of *Ustilago nigra*.**—*Phytopathology*, xxxiii, 4, pp. 324–327, 1943.

Seven different races of *Ustilago nigra*, the loose smut infecting barley seedlings [*R.A.M.*, xxii, p. 298], were encountered among 168 collections from 23 States of the American Union, of which Minnesota provided the largest number (31), followed by Wisconsin, Texas, Pennsylvania, and New York, with 25, 17, 16, and 15, respectively. Race 4 was encountered more frequently than all the others combined and was widely distributed: it may be identified by the susceptibility of the Hannchen C.I. 531 (20 to 46 per cent. from 1935 to 1941), Lion C.I. 923 (16 to 37), and Odessa C.I. 934 (35 to 82) varieties, the other three used for differential purposes, viz., Excelsior C.I. 1248, Himalaya C.I. 1312, and Nepal C.I. 595 being immune or very highly resistant. These reactions resembled those to race 6 of *U. hordei* [*ibid.*, xvii, p. 308]. It is apparent that the existence of physiologic races must receive consideration in breeding projects for resistance to *U. nigra*.

THATCHER (F. S.). **Cellular changes in relation to rust resistance.**—*Canad. J. Res.*, Sect. C, xxi, 5, pp. 151–172, 3 pl., 3 graphs, 1943.

In further studies on changes in host cell permeability induced by fungal parasitism [*R.A.M.*, xxi, p. 468], it was found that the browning phenomenon caused in Kubanka wheat inoculated with *Puccinia graminis tritici* race 34 by encystment of haustoria and brown discoloration of cell walls, is accompanied by a progressively increasing permeability of host cells. The browning symptom is interpreted as an

expression of a change in the micro-environment of the fungus induced essentially by high temperature, which changes the host reaction from complete susceptibility to a type of resistance lethal to fungus growth.

In studying the mesothetic or x reaction of Thatcher wheat to *P. g. tritici* race 56, resistance was found to be associated with greatly decreased permeability, and susceptibility with an increased permeability of host cells, these results being in agreement with reactions shown by different varieties of wheat to several races of the rust. Hardening of wheat plants to cold, which under some conditions caused a slight lessening of resistance symptoms, did somewhat increase the permeability of host cell membrane, but this initial effect tended to be obscured by the effects of other, as yet unknown, factors. Infection of oats, barley, wheat, and maize plants with *Ustilago levis* [*U. kolleri*], *U. hordei*, *Tilletia levis* [*T. foetida*], and *U. zeae*, respectively, did not alter the degree of susceptibility to their specific rusts (*P. g. avenae*, *P. g. secalis*, *P. g. tritici*, and *P. sorghi*, respectively). In an incomplete experiment with Hope wheat inoculated with *P. g. tritici* race 21, high osmotic pressure was found to exist in resistant mature leaves (17.8 atmospheres), the values for susceptible seedling leaves, culms, and glumes being much lower (from 11 to 11.82, 11.8, and 11.2 atmospheres, respectively). It is tentatively suggested that although high osmotic pressure *per se* may not be interpreted as a cause of resistance, yet a lack of availability of water to the parasite may be a contributing factor to resistance in mature plants of this group. Vital histological examination of resistant flecks on Vernal wheat inoculated with *P. g. tritici* race 34, indicated that a fungus secretion causes death of the host cells some time before the parasite itself is injured. Although need for further investigation is stressed, it is suggested that host cell permeability may perhaps be affected by some enzymes (possibly one protease and one lipase) secreted by the fungus, and be either increased or decreased, depending upon which of the enzymes was operating.

BITANCOURT (A. A.). *Recomendações para combater e minorar os estragos da 'podridão das radículas' dos Citrus. Ainda sobre a 'podridão das radículas' dos Citrus.* [Recommendations for the control and reduction of the ravages of Citrus 'root rot'. More about Citrus 'root rot'.]—*Biológico*, ix, 2, pp. 41–44, 1943.

Since 1937 a citrus root rot, previously unknown in Brazil but lately recognized as identical with the disease responsible from 1933 onwards for such heavy damage in the northern Argentine [*R.A.M.*, xxi, p. 485], has been decimating groves of sweet grafted on sour oranges in São Paulo, where tangerines and, to a lesser extent, grapefruit on the same stock are likewise susceptible. The principal measure of control consists in the use of resistant stocks, such as rough and Persian lemons and *Citrus* [*Poncirus*] *trifoliata*, technical directions for the introduction of which into existing plantations are given.

Cane mosaic disease legislation.—*J. Jamaica agric. Soc.*, xlvi, 8–9, p. 210, 1942.

Under the Mosaic Disease of Sugar Cane Order, 1942, superseding the one of 1936, any district of Jamaica within a $\frac{1}{4}$ mile of sugar-cane cultivation five acres or more in extent is considered a cane priority district in which maize and guinea corn [sorghum] may not be grown within 100 yds. of cane. Permission must be obtained by every grower who proposes to extend his cane-growing area to five acres or more should the new cane planting come within 100 yds. of maize land. The roguing of young cane (less than four months old) remains compulsory, but an appeal can be made to the Director of Agriculture concerning the treatment to be employed in cases where there is more than 10 per cent. infection. The order forbids the use of planting material from fields with more than 10 per cent. infection. The Director of Agriculture may enforce the planting of only resistant or immune varieties of cane in any area where he may consider this desirable.